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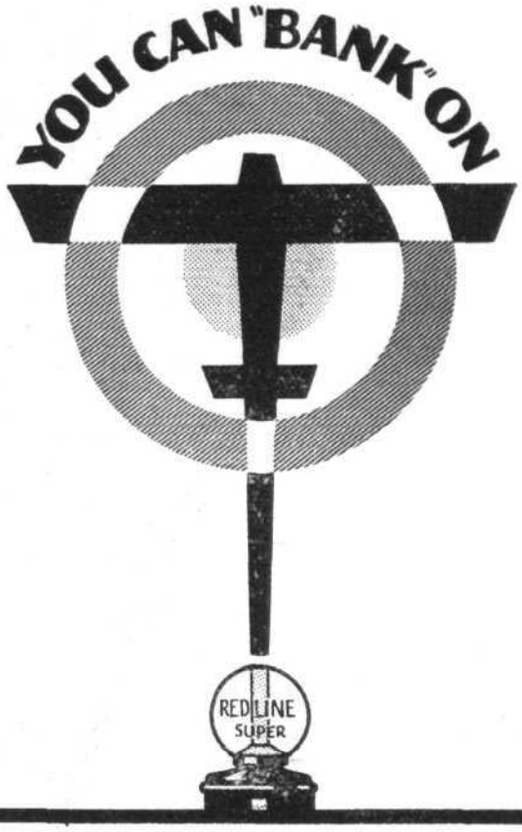
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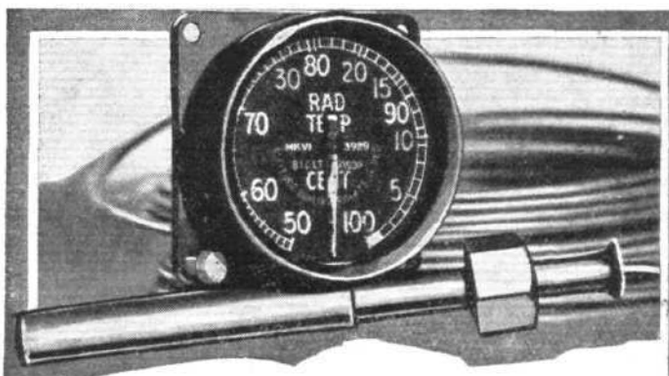
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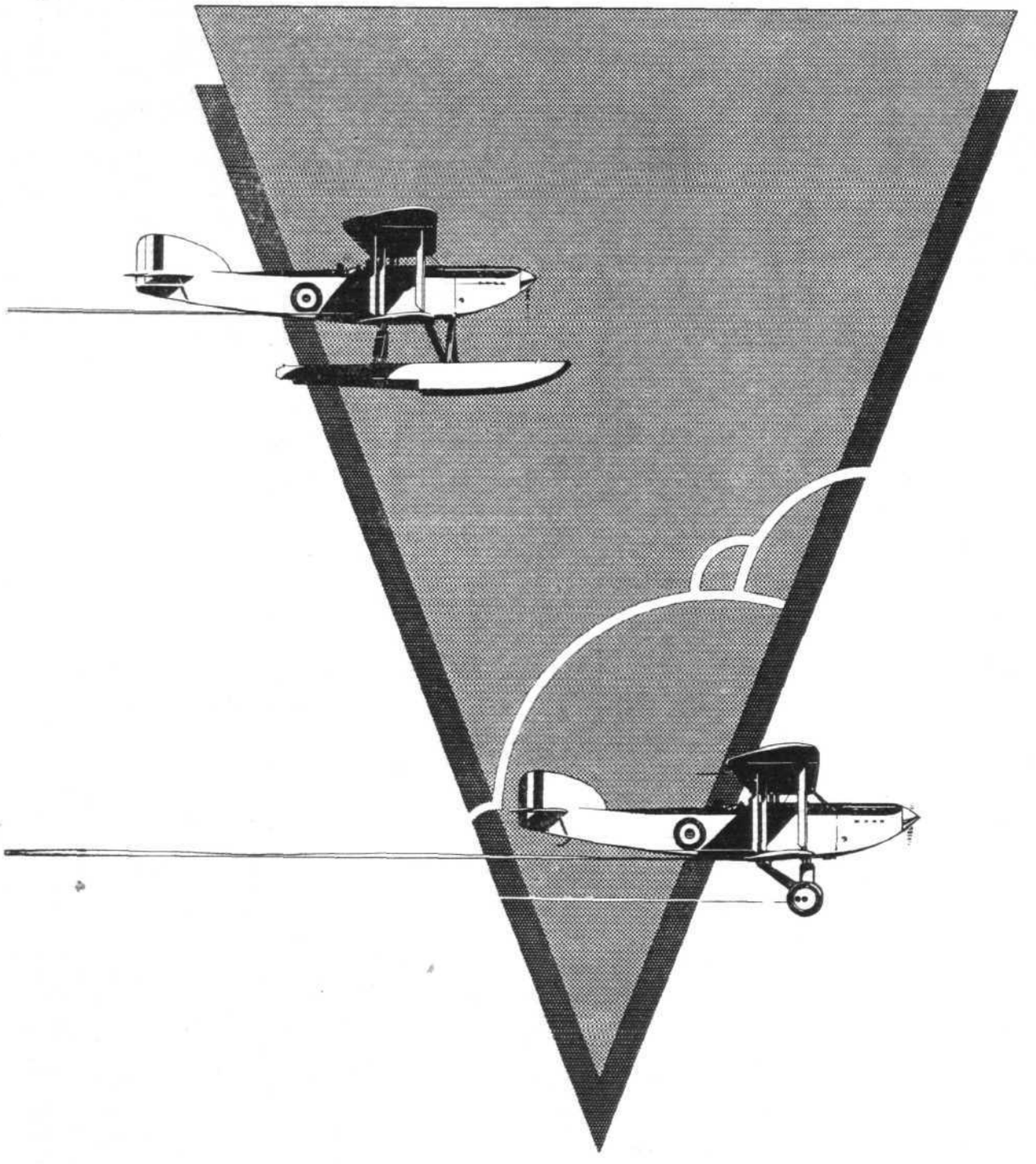
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DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list—

1929.

June 19-22 F.I.A. Conference, Copenhagen.
June 22 Air Display at Northenden, Cheshire.
June 27-30 Rotterdam International Air Meeting.
July 5-6 King's Cup Race and Siddeley Trophy Tour.
July 13 R.A.F. Display at Hendon.
July 16-27.... 7th International Aero Exhibition, Olympia.
July 25 Bleriot Cross-Channel Flight Anniversary Fete, Calais.
July 28 International Flying Meeting, Sweden.
Aug. 1-14.... French Light Plane Meeting, Orly.
Aug. 15 International Balloon Race, Poland.
Sept. 6-7 Schneider Trophy Race, Solent.
Sept. 10-20 Aero Club de France Meeting, Le Baule.
Oct. 1 Gordon-Bennett Balloon Race, St. Louis, U.S.A.
Oct. 31 Guggenheim Safe-Aircraft Competition Closes.

EDITORIAL COMMENT



IT is now many years since the first amphibian aircraft was produced (the first in Great Britain being the Sopwith machine on which the late Mr. H. G. Hawker won the prizes offered by Sir Mortimer Singer, whose death was announced the other day), and from time to time attempts have been made to introduce the type. There are considerable difficulties in the way, mainly those of extra weight and complication. Of recent years the amphibian type has almost entirely disappeared from the list of British civil aircraft, largely, no doubt, due to the introduction of the three-engined power plant arrangement which enables a landplane to traverse considerable stretches of sea with safety. In the case of the single-engined light 'plane, however, there can, we think, be no doubt that the possibilities of the amphibian are very well worth exploring. We do not by any means underrate the difficulties, but we do believe that the advantages are such that in very many cases the owner will be content to sacrifice a certain amount of useful load or performance in order to secure the vastly increased choice in "landing grounds," which the amphibian type offers.

Amphibian Light 'Planes

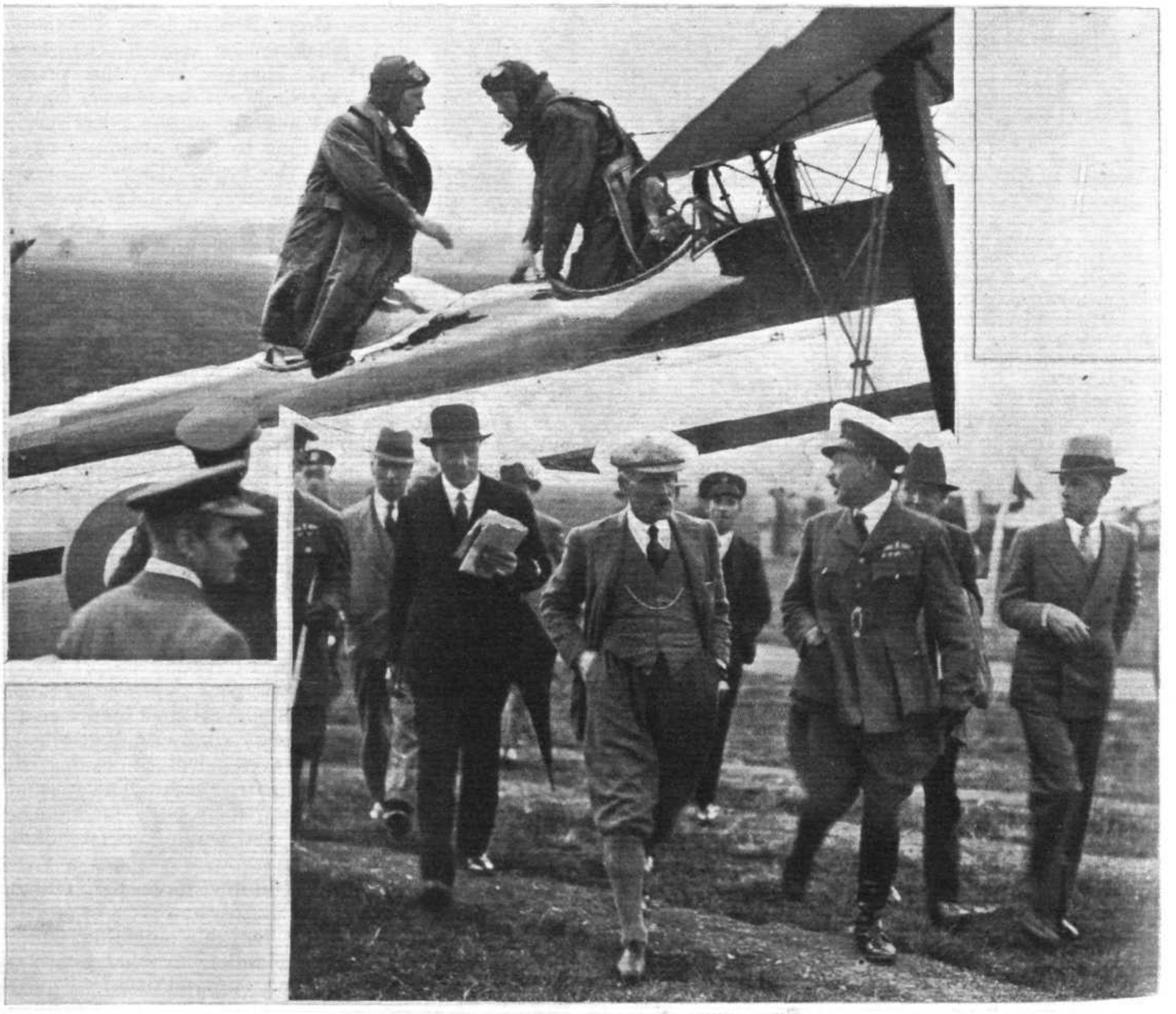
It would be futile to attempt to dogmatise as to what type of aircraft can most readily be produced as an amphibian. The flying-boat type is, perhaps, the one with which we have had most experience, but unfortunately the very small single-engined-flying-boat (say, in the two-seater size) is not regarded as a promising type in other respects. The normal two-seater light biplane on a float undercarriage is, of course, a familiar type, and would seem to have possibilities. The single-float biplane is not a type with which we in this country have had much experience. In the United States, however, there has been rather a preference for the single-float-cum wingtip-floats arrangement, and from what one can gather this type has amply proved itself. Quite recently Short Brothers have produced, for Mr. John Scott Taggart, an amphibian undercarriage for his de Havilland Gipsy-Moth, and this makes use of

the single central float arrangement in conjuncton with a retractable undercarriage. We are able to publish elsewhere in this issue of FLIGHT some photographs of the Gipsy-Moth with the new Short undercarriage, from which it will be seen that the land undercarriage consists of two wheels mounted in forks from a large-diameter cross tube secured in the internal structure of the float. The machine is to be exhibited at the forthcoming Olympia show, and it is not, therefore, considered necessary to give a detailed description at the present time, but the fact that such a type of undercarriage has been produced is significant and deserves to be recorded as prominently as possible.

Complete tests with the new amphibian undercarriage have not yet been completed, and so it would be rather premature to express any very decided opinion on the merits or otherwise of the new arrangement. That it represents a very bold experiment must be admitted. To begin with, the central float system is, as we have said, relatively untried in this country. And the wheel portion of the new Short system is also an experiment, inasmuch as the land chassis is carried as a pure cantilever both for direct bending loads and also for torsional loads due to the resultant not passing always exactly along the line of the forks. Then there is the case of one wheel touching before the other. When this happens a somewhat severe load may be thrown on to the central fitting inside the float. However, tests are now proceeding, and whatever the results, Short Brothers are to be congratulated upon having once more pioneered a new departure. Whether this particular chassis arrangement, or a variation thereof, is ultimately adopted, the mere fact that a beginning is being made is a source of satisfaction.

One objection to the single-engined seaplane of any type is that it is somewhat difficult to handle on the water. In the multi-engined type the outboard engines are extremely useful for turning the machine in a short distance. It would appear that on the single-float undercarriage produced by Shorts (which now has a water rudder that also acts as a tail skid) some form of plate on the outboard floats, acting as a drogue rather than as a rudder, might give a rather powerful turning moment—perhaps too powerful !

◈ ◈ ◈ ◈



OUR FIRST PRIME MINISTER TO FLY : Mr. Ramsay MacDonald, Prime Minister of the new Labour Government, thanking his pilot on landing at Hendon on June 20 after flying from Lossiemouth in the R.A.F. Fairey IIIF, a distance of 500 miles. He is seen being received by Wing-Commander W. J. Y. Guilfoyle, O.B.E., M.C., q.s. The pilot was Flight-Lieut. H. W. Heslop. *"FLIGHT" Photographs*

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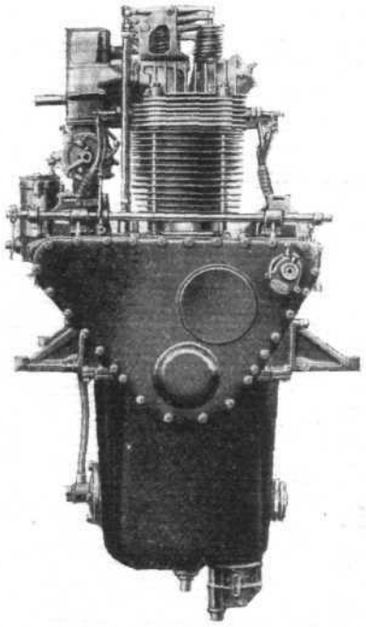
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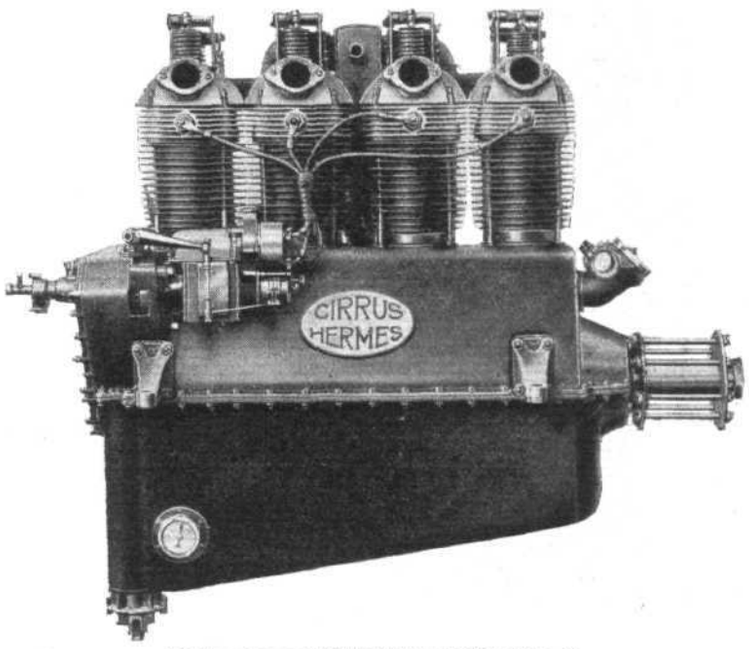
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Side view "CIRRUS HERMES."

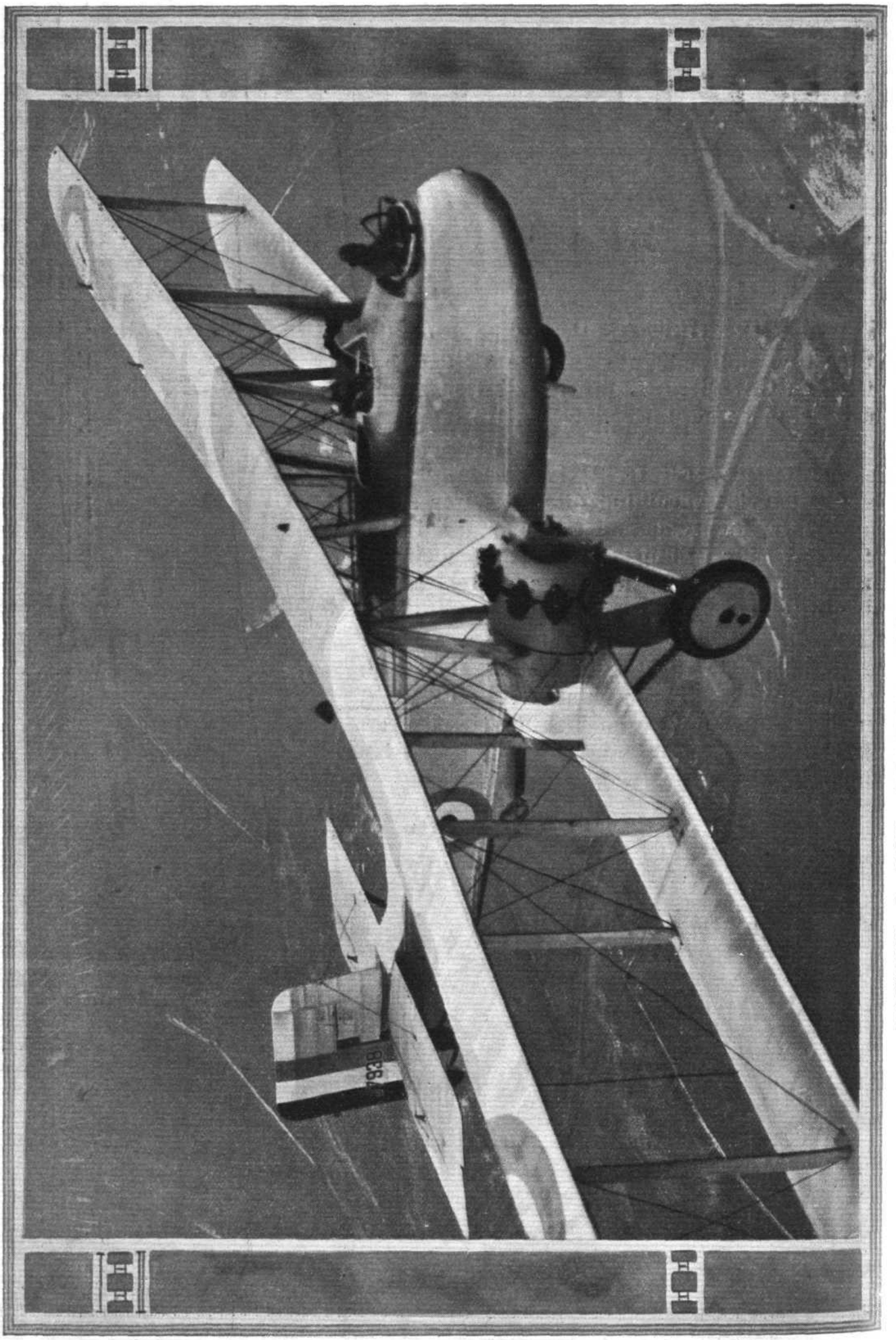
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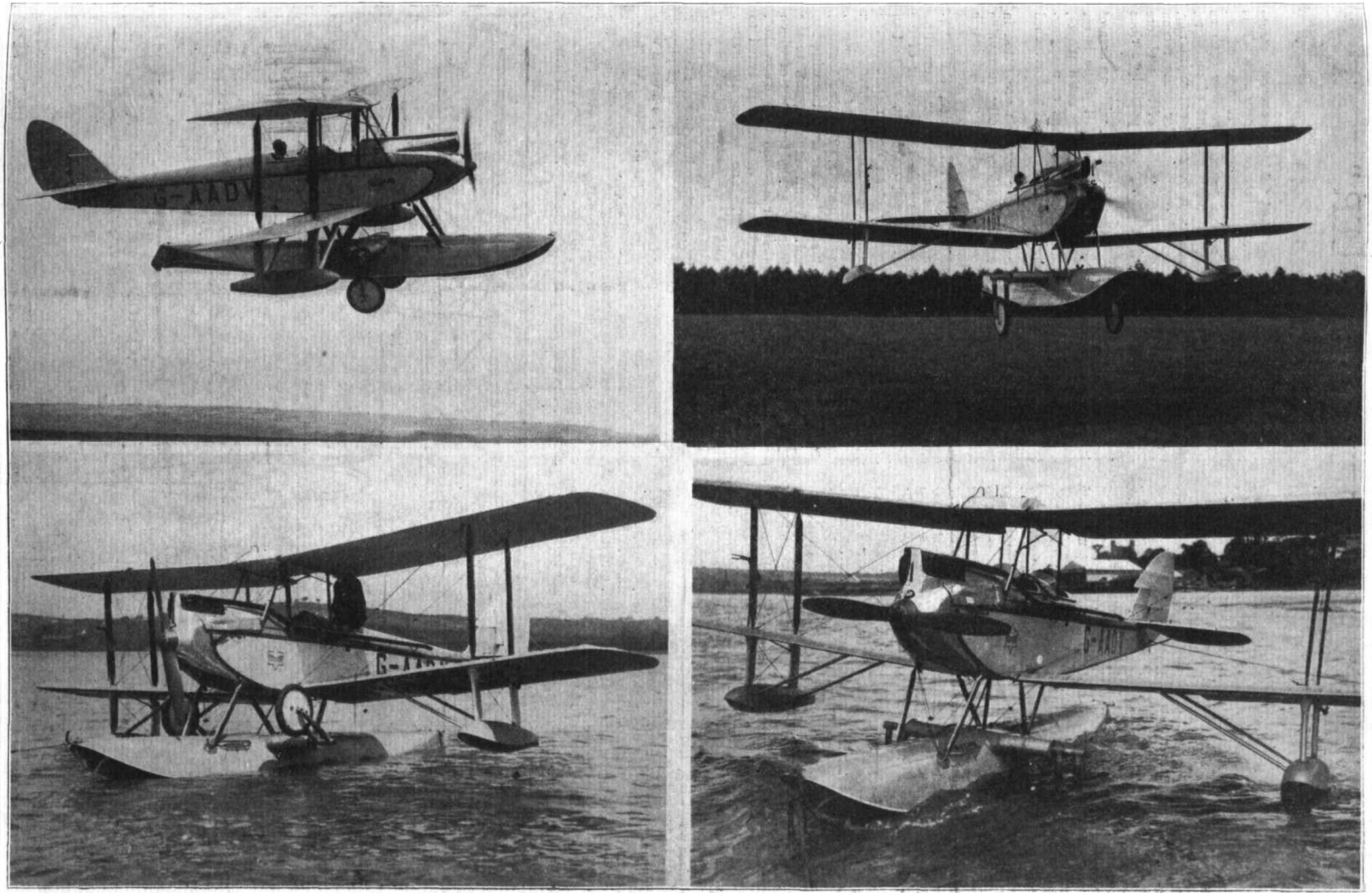
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[Photograph by "FLIGHT."

BOULTON & PAUL ALL-METAL "SIDESTRAND" DAY BOMBER.



THE FIRST BRITISH AMPHIBIAN LIGHT 'PLANE: These four photographs show a de Havilland "Gipsy-Moth," belonging to Mr. John Scott Taggart, for which Short Brothers have designed and built an amphibian undercarriage. The photographs show the machine in flight over Lympne aerodrome (FLIGHT Photos.) and at rest on the waters of the Medway off the Short Works. The pilot is Mr. Lankester Parker.

THE CURTISS-REID "RAMBLER"

A Canadian All-Metal Light Aeroplane

WHEN a designer can sit down with a clean sheet of paper, a clear perception of what he wants to do, with no necessity to study existing machinery or conform to previous shop-practice, it is only to be expected that an interesting machine will develop.

With a brand new factory at his disposal, not very extensive at present, but planned from the ground up for growth without complications, Mr. W. T. Reid, F.R.Ae.S., A.M.I.Mech.E., who has served with the Royal Aircraft Factory, Farnborough, with the Bristol Aeroplane Company, and more recently with Canadian Vickers, Ltd., has had full scope to produce a light, all-metal folding-wing machine with many outstanding features.

The "Rambler," as it has been named—and to which reference has already been made in FLIGHT—is entirely of Canadian design and manufacture, save for the Cirrus Mark III engine, which is its standard power plant. The only wood in the whole machine is the plywood flooring of the cockpits. Fabric covering of the metal fuselage and wing structure permits any distortion to make itself immediately apparent, and the interchangeability of many of the parts fits this machine particularly for use in the Dominions where distances are great and spare parts not always easily obtainable.

The wings are of sesquiplane design, the top plane having a span of 33 ft. and a chord of 5 ft. 6 in., while the lower plane measures only 22 ft. 5 in. in span and 3 ft. 9 in. in chord. The total wing area is 238 sq. ft., giving a loading at the normal flying weight of 6 lbs. per sq. ft. Both planes have an angle of incidence of 3° and a dihedral of 1°. The tubular spars are aluminium alloy, on to which are slipped the channel section, pressed metal ribs, of R.A.F. 15 camber, bored for lightness. Drift bracing is by diagonal tubes, rigidly attached to the spars and requiring no "rigging."

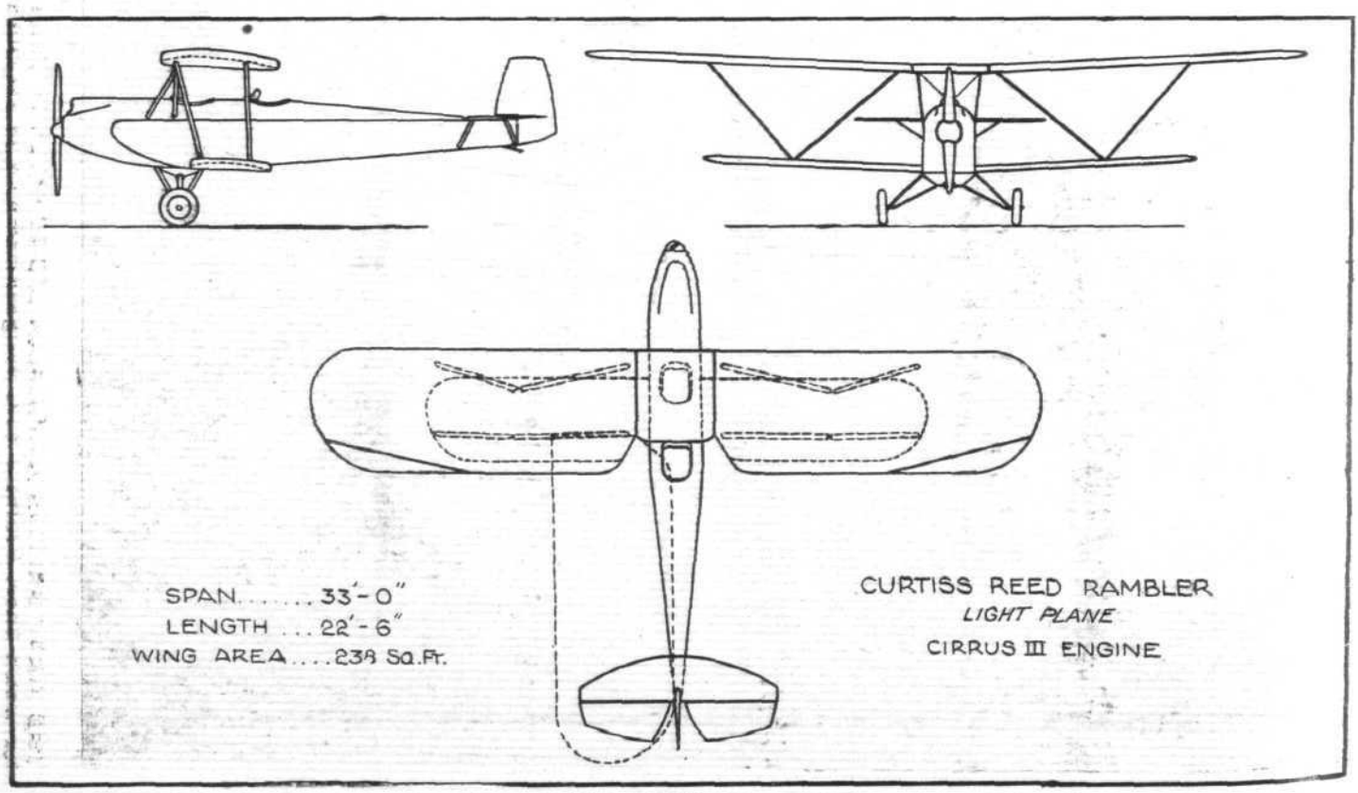
Interplane struts are of streamline seamless steel tubing, bolted to the spars, and forming a triangulated structure that requires no wiring, and consequently no adjusting. The rear spars are hinged to a bracket on the fuselage, and the front spars, when the wings are spread, are secured with steel pins that can only lock when fully inserted, and further tethered by a leather strap with a snap fastener. When folded, the machine has a spread of 11 ft. 1 in., and a height of 8 ft. The wings can be locked in the folded position. On account of the shortness of the lower plane, access to the empennage is not obstructed when the wings are folded.

The fuselage is of seamless steel tubing, longerons, struts and diagonal bracing being welded into one single unit. This unit is *not* treated internally with oil before it is sealed up. The designer contends that in a sealed structure such as this, there can be only a very small amount of moisture. The effect of that moisture, spread over the entire interior, must be negligible, but should one spot for some reason fail to receive its coat of oil, all the action of the moisture would be concentrated at that place, with possibly serious results.

Seamless steel tubing forms the tail plane, with an area of 15·2 sq. ft., elevators, and rudder. The tail plane is set at approximately 2° less incidence than the main planes, and the machine may be trimmed by means of a spring-loaded device, operated from the pilot's cockpit and attached to the elevator cables.

Conventional stick and rudder-bar controls are fitted in both cockpits, with the forward stick readily removable from its socket. Control wires are notably carried inside the fuselage and wing structure. Neither elevators nor ailerons have external king-posts. In the former case, the interchangeable flaps are bolted together centrally, and moved by a king-post extending downwards into the interior of the fuselage, where a push-and-pull rod transmits the motion of the cables. This is ordinary clean design, but in the aileron controls a new and interesting device is called into play. Note that the aileron is not hinged to the rear spar itself, but is inset in the trailing edge at an angle. This, incidentally, gives it a good grip of the "spill" of air from the wing-tip, especially near stalling speed. At an angle, again, to the aileron spar is hinged a tubular triangle, the apex of which forms a ball. On the rear main spar is bolted a chain sprocket, carrying a short arm, the extremity of which is bored to receive the aforementioned ball. The whole apparatus, which sounds complicated, but is really very simple, is contained inside the wing structure. The control cables, both of which run through the wing structure just back of the rear spar, operate the sprocket through an inset length of bicycle chain, and exert a very powerful leverage on the aileron with a light touch on the stick. The ailerons are interchangeable, and have a combined area of 8·94 sq. ft.

Two short king-posts, forming an inverted V, are the terminals of the rudder control wires. The steel post on which the balanced rudder, measuring 8·12 sq. ft., swings, is set at the extreme rear of the fuselage. No fin is fitted.



THE CURTISS-REID "RAMBLER": General arrangement drawings.



CROYDON TO CHINA
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On March 2nd of this year, Mr. Wenlin Chen left Croydon Aerodrome in an Avro Avian. On May 10th, he arrived at Amoy, China. Throughout this 14,000 mile flight across Europe and Asia no trouble was experienced, and Mr. Wenlin Chen expressed complete satisfaction with the machine. This Avro Avian is one of fourteen ordered by the Chinese Government for a school to be opened at Nanking.

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For this great effort a British motor oil was chosen, CASTROL—the oil that has a world-wide reputation for unfailing efficiency under the most arduous conditions.

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The "Cirrus" engine is conventionally mounted on four lugs welded in the fuselage construction, and is streamlined by neat hinged cowling. A point of interest is the grouping together in this cowling of a magneto switch, a throttle control and a dope-pump, for the convenience of solo pilots, obviating continual climbing in and out of the cockpit.

The original undercarriage of the "Rambler" is another feature of interest. Each side of the landing gear is a separate, identical and interchangeable unit, formed of three streamline steel tubes and three smaller tubes welded rigidly together. Two of the main tubes form a conventional-looking V, and are hinged to the fuselage at their upper ends. The third forms one half of the split axle, and is forked at its inner end, while carrying the wheel on a projection at the opposite end. The forks are secured to a shock-absorbing device that "floats" under the centre of the fuselage, to which it has no direct connection. An extreme flexibility is obtained by these means, and as the shock-absorbing unit adjusts itself to the load or impact on either wheel, there is a damping action between the two, calculated to avoid bouncing.

Hydraulically-operated brakes are to be fitted as a standard equipment, and here again forethought has been exercised towards nullifying their dangerous use. Both brakes are normally applied by means of a lever in the pilot's cockpit, but by connecting the tailskid to the circuit, no braking effect can be secured until weight rests on the skid, by which time there is no tendency to nose over. In taxying, either brake is brought into play separately when full rudder is applied, by means of a knob on the rudder cable that engages with a fork, still subject to the proviso of there being weight on the tailskid.

Deep cushions, which can readily be replaced by parachute packs are supplied in both cockpits, and the equipment includes a safety belt, Pyrene, tool-kit, a tail-handling device for moving the machine when its wings are folded, as well as the following instruments of consolidated make: airspeed indicator, rev. counter, altimeter, oil pressure gauge and compass. Baggage can be stowed in a large compartment aft of the pilot's seat, and both cockpits are provided with lockers for maps and other small articles.

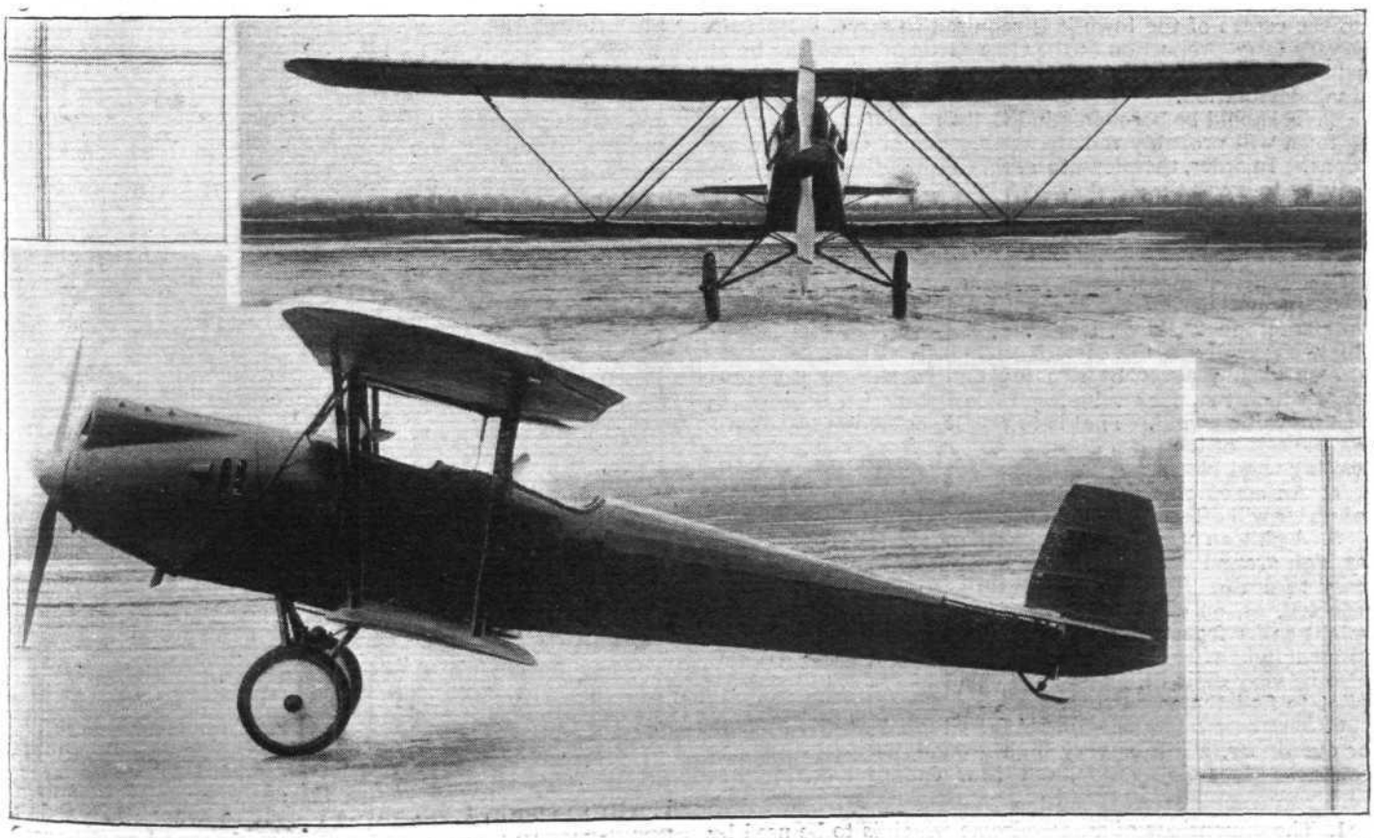
Twin metal floats can be readily fitted instead of the wheel landing gear.

The empty machine weighs 850 lb. With 20 gallons of petrol in the top centre-section tank, 1 gallon of oil, pilot and passenger at 180 lb. each, and 80 lb. of baggage, the weight reaches 1,445 lb., at which the machine has full aerobatic factors as laid down by the I.C.A.N. It may be flown commercially under the same factors at an all-up weight of 1,650 lb., but may not be stunted. The service ceiling is set at 16,000 ft., with a rate of climb near the ground of 800 ft. per minute.

A. H. S.



The neat engine cowling and landing gear of the Curtiss-Reid "Rambler."



THE CURTISS-REID "RAMBLER: Front and side views of the Canadian all-metal light 'plane, with "Cirrus III" engine.

HOW TO ESTABLISH A CIVIL AERODROME

New Aerodromes for Handley Page, Ltd., and Fairey Aviation Co., Ltd.

THE efforts to bring this country up-to-date by establishing an adequate number of aerodromes are quietly proceeding. There are many important bodies assisting in the work. The Air Ministry has organised a special department for the purpose, which is under the supervision of Major Mealing, who has personally inspected a large number of proposed sites on behalf of municipalities, and is still faced with a large number to inspect. It is certain that the activities of National Flying Services will hurry the preparation of many aerodromes, for they are in the position of being immediate clients of municipalities.

The number of new private aerodromes is quietly increasing, more so than municipal aerodromes. They include now the Reading Aerodrome of Messrs Phillips and Powis, the Haldon Aerodrome near Teignmouth of the Agra Engineering Co., both of which have been in commission for a long time. Recent private aerodromes are Marshalls' at Cambridge, Airworks' Aerodrome at Heston, and Donald Stevenson and Co.'s Maidenhead aerodrome. Northern Air Lines, Ltd., has been the impetus which has brought Manchester's temporary aerodrome at Wythenshawe into life. Hull has already chosen a site. A private owner of extensive experience kindly informs us of a new field situated 2½ miles south-west by south of Colchester.

Handley Page, Ltd., has purchased a site of 154 acres near Radlett, Hertfordshire, and the location of the aerodrome is shown in our map accompanying this article. Radlett railway station is quite near the aerodrome, and not more than twenty minutes from London. The surface is in good condition, and very even. Cricklewood aerodrome will not be used in the future, but the Handley Page works will still be there.

The new Aerodrome for the Fairey Aviation Co., is at Heathrow ofl the Bath Road, and about 2½ miles from Cranford. We hope shortly to give fuller details and a map.

A new pamphlet has been issued by the Air Ministry, entitled Notes on the Location, Size and General Requirements of a Site for a Civil Aerodrome. It is more up-to-date than the previous pamphlet issued, which we published in these columns. It is an authoritative and necessary guide to other private companies like those mentioned above who are proposing to establish an aerodrome. We give most of the particulars here :—

Location

1. A civil aerodrome must be situated as near as possible to the centre of the town it is required to serve. Otherwise a very large proportion of the time saved in travelling by air will be lost in travelling between the Aerodrome and one's final destination.

2. It should be borne in mind that the chief air routes from a town will probably radiate in only one or two main directions. In order, therefore, to avoid the majority of passengers having to cover the same ground twice—*i.e.*, having to travel from the town to the aerodrome and then fly back over the town—the aerodrome should, other conditions being equal, be situated on the side of the town from which the majority of the routes radiate.

3. In considering the matter from the aspect suggested in paragraph 2 above, it should, however, be remembered that, especially in the case of an industrial town, the aerodrome should never be situated on the side of the town over which the smoke, dust and consequent fog is blown by the prevailing wind. That is to say, it should not be situated on the side of the town opposite to that from which the prevailing wind blows.

4. An aerodrome situated near a river or a large expanse of water will often suffer from fog.

5. A plateau often makes an excellent site for an aerodrome as high ground is unaffected by low-lying fog, and is usually easy to drain. Too high a plateau should not, however, be selected, as, on days when the clouds were very low, pilots might suffer from the handicap of entering the cloud almost immediately after taking off from the ground, while it would also be very difficult, under such conditions, for an incoming pilot to find the aerodrome.

6. The aerodrome should not be situated at the foot of, or even near, a hill or very high ground, as the latter may cause a serious obstruction, and thus endanger the aircraft.

Size

1. The dimensions of an aerodrome which is to be used by the larger types of aircraft should be not less than 600 yards in all directions, and should, if possible, be 800 to 1,000 yards. Only in very exceptional circumstances will a site affording in any direction a clear run of less than 600 yards be licensed and in that case the absolute minimum will be 500 yards. Should it be necessary to reserve a site measuring less than 600 yards in any direction all the ground outside of and within 100 yards of the perimeter of the aerodrome must contain no obstruction higher than the average 3 ft. fence or hedge.

2. For light or small aeroplanes a site measuring 400 yards in all directions will suffice, subject to conditions regarding a clear perimeter contained in paragraph 1 above.

Obstructions

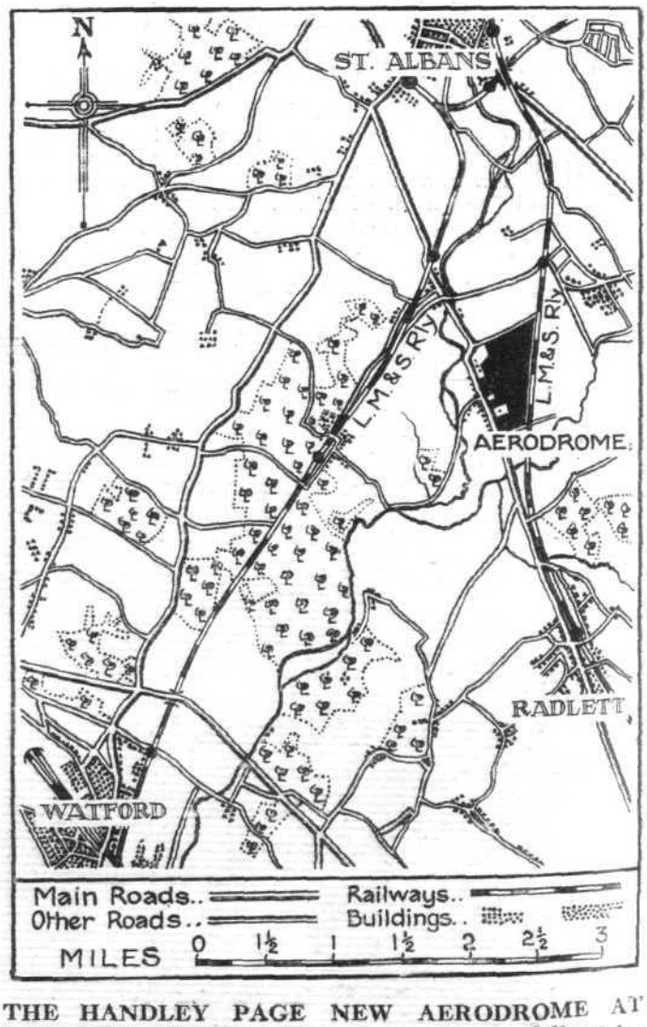
1. A site should not be chosen which is surrounded by or even adjacent to, insuperable obstructions such as church spires, tall chimneys, etc. Arrangements can usually be made for the removal of trees.

2. An obstruction diminishes the available space for landing and taking off by a distance equal to ten (10) times its own height measured from the foot of the obstruction. If, for instance, in a certain direction the aerodrome measures 700 yards and there is a row of tall trees 60 ft. high on the border of the aerodrome, the useful available space will be only 500 yards—that is, 700 yards minus 200 yards (ten times 60 ft.).

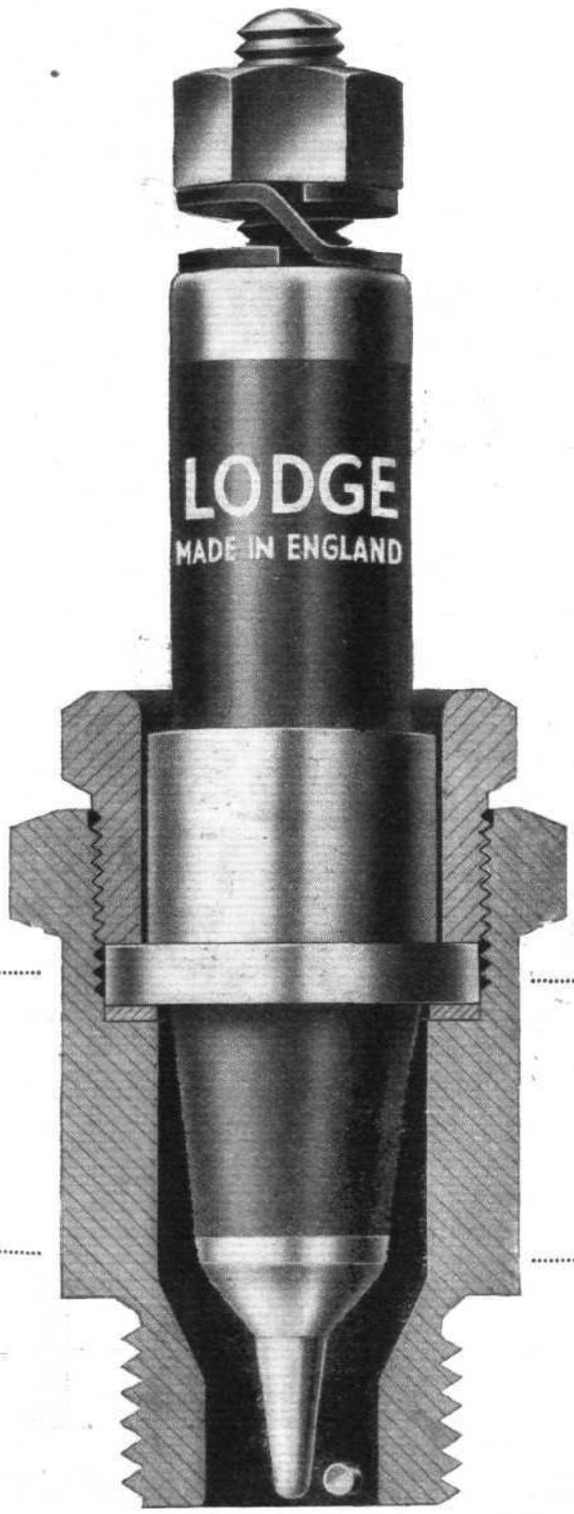
Gradient and Surface

The average gradient of an aerodrome should not exceed 1 in 50 and the actual gradient of any particular undulation should not exceed 1 in 40.

1. The surface should be smooth enough to allow a motor car to be driven over it at 20 m.p.h. without any inconvenience to the occupants.



THE HANDLEY PAGE NEW AERODROME AT RADLETT, HERTS : The sizes are as follows :— North to south, 1,393 yards ; east to west 733 yards ; north-east to south-west, 1,393 yards ; and north-west to south-east, 1,026 yards. It is 154 acres in area, and only twenty minutes by rail from London.



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Suitable for medium compression engines.

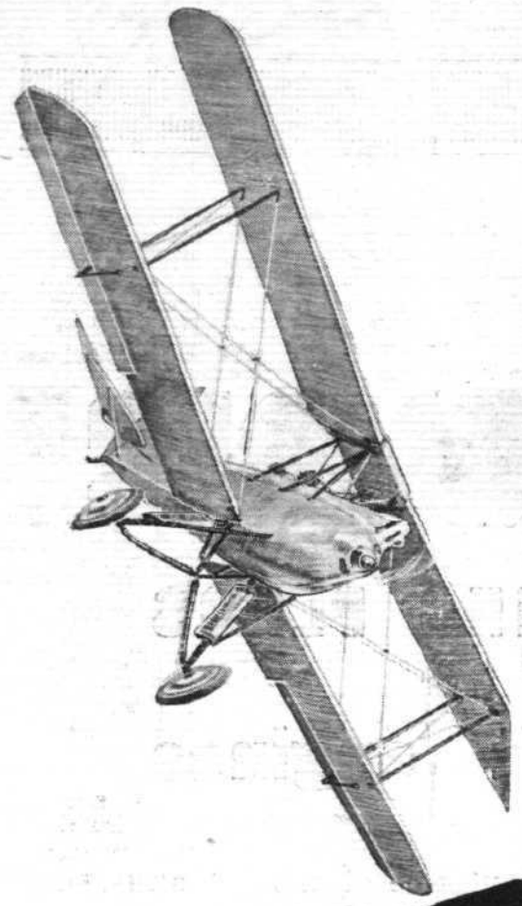
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FOR 2-SEATER LIGHT AIRCRAFT

(JUNE 1929)

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WORLD'S HEIGHT RECORD

FOR 2-SEATER LIGHT AIRCRAFT

(JUNE 1929)

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THE WORLD'S PREMIER TRAINING AND PRIVATE AIRCRAFT

See the Moth on Stand 16 Section A and the Gipsy Engine on Stand 15 Section B at the Olympia Aero Exhibition, July 16th — 27th, 1929.

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Stag Lane Aerodrome, Edgware, Middlesex

THE DE HAVILLAND AIRCRAFT OF CANADA, LIMITED
Bay-Richmond Building, 372 Bay Street, Toronto 2, Canada

THE DE HAVILLAND AIRCRAFT PTY., LIMITED
Whiteman Street, South Melbourne, Australia

Streets

2. Failing some artificial covering the surface should be composed of turf and should be strong enough to withstand a pressure of 1 ton per sq. ft.

3. If the surface will not withstand a pressure of 1 ton per sq. ft. it may be necessary to drain it and to build runways composed of clinker, tarmac or concrete, such runways being 500 yards long and 100 ft. broad. A rough but good test for any such surface is to drive a fully laden 3-ton lorry across it slowly. If there is no tendency for the wheels of that lorry to sink into the ground it may be taken for granted that, under ordinary circumstances, neither the wheels nor tail skid of any present-day aeroplane will tend to sink in.

Communications

It is very necessary that an aerodrome should have quick communication, either by road, train, bus or rail, with the town it is intended to serve, and it will certainly be necessary to have a telephone laid on.

Services and Licences

When the buildings are erected so as to create a fully-equipped aerodrome it will be necessary to have water and electric light laid on.

1. Section 7, paragraph I of the Air Navigation Consolidation Order (1923) says that " a place in Great Britain and Northern Ireland shall not be used as a regular place of landing or departure by aircraft-carrying passengers for hire or reward, unless it is licensed for the purpose by the Secretary of State, and any conditions of such licence are complied with."

2. In accordance with the Air Navigation Directions (1928) (AND. 7), Section XI, paragraph 103 " Licensed aerodromes," aerodromes are divided for licence purposes into two categories :—" (*a*) Aerodromes licensed for use only by the licensee and by individuals specifically authorised by him. (*b*) Aerodromes licensed for public use." It will follow naturally that the majority of aerodromes will require " public use " licences, as only this type of licence will be of use to a local authority.

Establishment, Finance, etc.

Under Section 8 of the Air Navigation Act, 1920, any local authority to which this section applies with the consent of the Air Council, and subject to such conditions as the Air Council may prescribe, has power to establish and maintain aerodromes (including roads, approaches, buildings, etc.) to acquire land by agreement for that purpose by purchase or hire; to carry on any subsidiary business certified by the Air Council to be ancillary to the carrying on of an aerodrome and to borrow money for these purposes under the Acts referred to in this Section.

◇ ◈

Sir Mortimer Singer

WE regret to have to report the death, at 65 years of age, of Sir Mortimer Singer, K.B.E., on June 24. He was the eldest son of Mr. Isaac Merritt Singer, the inventor of the Singer sewing machine. An American by birth, he was educated at Cambridge, and became a naturalised British subject in 1900. In his earlier years, he took up aviation, and obtained No. 8 pilot's certificate, whilst for some years he was Hon. Treasurer of the Royal Aero Club. In 1910, he attended an aviation meeting at Cairo as the British representative, and crashed his machine, breaking both his legs and one arm. After recovering, he continued to fly and then engaged a French pilot. He was a noted sportsman in many branches of sport, including racing and yachting.

Prime Minister's 500-mile Flight

MR. RAMSAY MACDONALD, the Prime Minister, flew from Lossiemouth, in the North-East of Scotland, to Hendon on June 20 in a R.A.F. Fairey-IIIF piloted by Flt.-Lt. Herbert W. Heslop, of No. 24 (Communication) Squadron, Northolt. His flight of 500 miles started at 10.30 a.m. and the machine flew down the coast to Edinburgh then turned inland and flew south to Catterick, in Yorkshire, where the Prime Minister had lunch with the R.A.F. Officers. In the afternoon the flight was resumed and the machine landed safely at Hendon at 4.10 p.m. The Prime Minister, who was received by Wing Commander W. J. Y. Guilfoyle, who commands Hendon, expressed pleasure with his experience of flying, which is comparatively novel to him, for he had only flown once before : from Lossiemouth to Edinburgh. The Fairey IIIF was escorted by another Fairey IIIF. No. 24 (Communication) Squadron is commanded by Sqdn.-Ldr. D. Don who acts as pilot to the Prince of Wales.

Southern Cross Enquiry

THE report of the Air Inquiry Committee, appointed by the Federal Government in Australia to enquire into the forced landing of the *Southern Cross* monoplane in North-west Australia, flown by Sqd.-Leader Kingsford Smith, has been issued. According to Sydney accounts, the report criticises drastically the failure of the airmen to have efficient emergency wireless apparatus, and for not returning to Sydney when the wireless aerial was lost, which prevented the machine receiving warnings of the bad weather ahead. Reasonable care in the amount of emergency rations was not shown, and it was considered an error of judgment to be without tools, such as a hatchet or hammer. Before starting, no steps were taken to ascertain the state of the weather. The committee found no evidence, however, suggesting that the forced landing was premeditated, the crew intending to fly to Wyndham, making every effort to reach it. That Flight-Lieut. Ulm, the second pilot, did make suggestions on different occasions of winning publicity and financial support by getting lost in an aeroplane in Central Australia was, the report states, proved, but the committee thought that he was not serious. This point, however, and other evidence, caused the committee to regard his testimony with suspicion. Failure to communicate by wireless was attributed by the report, to ignorance, or lack of initiative, on the part of the operator, Mr. McWilliams, and that the 18 gallons of oil that remained should have been used to supplement fire signals. There was, however, no evidence to prove that the crew tried to conceal their position, or avoid being found.

◈ ◈

ON June 25 the *Southern Cross* started from Sydney in its second attempt to fly to England. The crew are Sqdn.-Ldr. Kingsford Smith, Flight-Lieut. C. Ulm, Mr. McWilliam, and Mr. Litchfield.

Cross-Channel Disaster Enquiry

THE official investigation into the Channel disaster to the Imperial Airways air liner, G-EMBT Handley Page on June 17, began at the Law Courts on June 25. Sir Arthur Colefax is presiding and the assessors with him are Air Commodore J. G. Weir and Mr. James Swinburne. Sir William Jowitt, Attorney General, for the Air Ministry, stated at the opening of the inquiry that one of the engines had failed, and it was plainly due to the fracture of bolts holding a connecting rod bearing, which enabled the connecting rod to get adrift. Among those who will give evidence are Major Cooper, Inspector of Accidents, and probably, Sir Sefton Brancker, Director of Civil Aviation. In regard to our short paragraph on this accident, published in FLIGHT last week, we regret to say, that this was founded on the first reports to hand, which subsequently were found inaccurate. It stated that the machine " turned over after striking the water," but we understand as a fact it did not. Capt. Brailli, the pilot, brought the machine down with the utmost skill under the unfortunate circumstances of the mishap.

The Prince to Open Olympia Aero Exhibition

THE Prince of Wales has consented to open, on July 16, the International Aero Exhibition at Olympia, and will, prior to the public being admitted at 2 p.m., make a tour of inspection at 12 noon.

The Royal Aero Club at the Olympia Aero Show

THE Royal Aero Club will have a stand at the International Aero Exhibition at Olympia (July 16 to 27), at which there will be an information bureau regarding the British light aeroplane clubs. Anyone, who may contemplate joining one of these clubs or who may be interested in the activities of the clubs, is invited to apply at this bureau for full information with regard to terms and conditions of membership. It is also announced that the Council Room at Olympia is being placed at the disposal of the Royal Aero Club by the organisers of the Exhibition, for the purpose of accommodating members of the Royal Aero Club and the light aeroplane clubs.

Paris Aero Show, 1930

FROM November 27 until December 14 in 1930 a Paris Aero Show will be held at the Grand-Palais.

Civil Aviation Ball

FROM Mr. April Day, ball organiser for the Air League of the British Empire, comes particulars of an " Aviation ball " to take place at Grosvenor House, Park Lane, on Friday, July 19—three days after the Olympia Aero Show opens. A whole heap of patrons has been secured, with Air Vice-Marshal Sir Sefton Brancker as president, and amongst the attractions promised are a spectacular tableau, at midnight, portraying " Civil Aviation and Britain," and many surprises both in entertainments and valuable prizes given by leading London firms. Tickets, which are 30s. each, include supper, and dancing is to go on from 10 p.m. until 4 a.m. There should be quite an assembly to honour the occasion.



Failure of Spanish Atlantic Flight

MAJOR FRANCO, Capt. Ruis de Alda, Capt. Gallarza and a mechanic, left Los Alcazares, the seaplane station of the Spanish Air Force, near Cartagena, on June 21, in an attempt to fly the Atlantic to New York *via* the Azores and Halifax. The machine was a "Dornier-Wal" fitted with two Hispano-Suizas, and it was reported at first to have safely reached the island of San Miguel in the Azores at 8 a.m., after flying through the night, but a later report, issued from Spain, contradicts this, and declares the machine to be missing. The British steamer *Greldon* is reported to have sighted aircraft wreckage 120 miles north-east of the Azores. An extensive search by aircraft and shipping, with the assistance of a British aircraft carrier, is being organised. Italian aircraft have been ordered to join in, and a Spanish submarine squadron is preparing to leave Cartagena. There is, it is hoped, a chance of the missing airmen having been picked up by a ship having no wireless. Major Franco, the leader of the flight, crossed the South Atlantic by air in 1926, with Capt. Ruiz de Alda, in a "Dornier-Wal" fitted with Napier "Lions."

Atlantic Flight Plans

THE American airmen, Capt. Yancey and Mr. Roger Williams, who made several unsuccessful attempts to lift their *Green Flash* (Bellanca monoplane) off Old Orchard to fly the Atlantic recently, are reported to have purchased another machine for the purpose named the *North Star*, their objective being Rome.

Ostend Air Rally

ON June 22 the second International Air Rally at Ostend took place, and was continued on June 23. On the first afternoon 26 machines arrived from England and Belgian towns, one of the first to arrive being Lady Bailey. The Belgian Air Minister, M. Lippens, flew to Ostend and received the foreign visitors, in whose honour the Belgian Aero Club arranged festivities. Lady Bailey was awarded first prize in the airwomen's division of a special class for single-seater light planes, and presented with a Diploma of Honour of the Belgian Aero Club. Mr. C. Uwins, the Bristol Aeroplane Co.'s test pilot, won first prize in the men's division of the same class.

Italian Service Cruise Completed

THIRTY-FIVE Italian seaplanes of the Italian Air Service completed their cruise from Italy to the Black Sea on June 19. Signor Mussolini flew to Orbetello on June 20 with General Balbo, Under-Secretary for Air, and reviewed the Squadron, which he also congratulated.

Hinkler Honoured

SQD.LDR. "BERT" HINKLER visited Copenhagen last week to be presented with the International Aeronautical Federation's Gold Medal for 1928.

An Important Link

IN consequence of an agreement between the Hungarian Air Traffic Company, the German Lufthansa, and the Royal Dutch Air Line, direct communication by air has been established between Budapest and London, via Vienna, Berlin, Hanover, Rotterdam and Croydon.

French Airwoman's Record

A PARIS report states that Mlle. Maryse Bastie has made a record duration flight for French airwomen by flying for 24 hrs. 24 mins. Her machine was a 40-h.p. light aeroplane, and her intention was to beat the record of 26 hrs. 21 mins. set up by the American airwoman, Miss Smith. Mlle. Bastie landed at Le Bourget on June 21, owing to the exhaustion of the fuel.

Indian Air Mail Progress

THE eleventh air mail to reach Croydon from India consisted of about 25,000 letters. Since its inception in April the Imperial Airways machines have covered over 100,000 miles, and carried half a million letters. When Group Capt. R. P. Mills, R.A.F., reached Rangoon on June 18, he is reported as saying that the London to India air service would be extended to Calcutta during this year, and to Rangoon on the completion of the aerodrome there.

Bengal Flying Club and King's Cup Race

THE Bengal Flying Club, Calcutta, has cabled the Royal Aero Club for a list of Entries for the King's Cup Air Race for their Club sweep.

Autogiro Progress

WE learn that Senor Don Juan de la Cierva has been carrying out experiments in Madrid with a new type of Autogiro—similar to the machine that will be exhibited at Olympia—and that it climbed to an altitude of 12,000 ft. in official tests. This new machine is fitted with a device for starting the rotor while the machine remains stationary, thus enabling a take-off to be made in an extremely limited space and with a very short run.

Welcome to Bristol

THE Bristol and Wessex Aeroplane Club., Ltd., will be glad to entertain to tea next Sunday, June 30, any competitors in the King's Cup Race who may be "inspecting" the course that day.

Canadian Air Disaster

CAPT. C. S. CALDWELL, the Canadian pilot, was testing a new machine over the St. Lawrence River at Montreal when it collided with overhead electric cables and crashed. Capt. Caldwell and his two passengers, the Hon. J. C. C. Jervis and Dr. W. D. Morris, were killed. The former two were connected with Canadian-Vickers Ltd.

Flying M.P.

SIR PHILIP RICHARDSON, M.P., flew from Marseilles to his home at Weybridge, Surrey, a distance of 700 miles, on June 20, in his own D.H. 50. He commenced his flight to the Continent about three weeks ago and visited Barcelona. He hopes to fly to Kenya Colony in the future.

Thames Seaplane Base

PERMISSION is being sought to establish a temporary seaplane base on the Thames at Hammersmith, for seaplanes and flying-boats visiting the International Aero Show, Olympia in July. It is also proposed to demonstrate duplicates of machines of the seaplane class on the Thames.

Sir Alan Cobham's Tour

WARRINGTON and Crewe were visited this week by Sir Alan Cobham in the course of his tour of Britain in the D.H. Giant Moth "Youth of Britain." Today (June 27) he is due at Rhyl where he will remain until Friday. After this he will fly to the following places:—June 29-30, Hull; July 1-2, Doncaster; July 3-4, Scarborough; July 5, Bridlington; and July 6-7, Sherburn-in-Elmet.

New Italian Aero Engines

THE Isotta Fraschini company of Milan have just had their "Asso 1000 Ri." aero engine subjected to official trials. This engine develops 1,100 h.p., and is probably the most powerful aero engine in the world. Another new Italian engine—at the other end of the scale—is a 5-cyl. air-cooled radial of 50 h.p. which is being put through its tests by the Italian "Gilera" motor-cycle firm. It weighs 90 kg. (198·5 lbs.) and has a displacement of 3,180 c.c. The Officine Ferroviarie Meridionali, of Naples, are also testing a small engine—details of which are not yet available, other than that it is a 3-cylinder engine. Both these last two engines are intended for light civil aircraft.

Italy and the Schneider Trophy

THE Italian Minister for Aeronautics having decided to place the Italian offensive in this year's Schneider Trophy Contest in the hands of new pilots, Maj. De Bernardi, Com. Ferrarin and Brak-Papa are, therefore, "out of the flying." Our Italian correspondent writes that the new pilots, who are in training at the Desenzano (Lake Garda) High Speed School, show great promise. Great secrecy is being maintained at the Macchi, Fiat, Piaggio and Siai works concerning Italy's Schneider machines, which will shortly go through the preliminary eliminating tests for deciding the actual challengers.

Light 'Plane Exhibition in Rome

AN exhibition of light planes was recently held at the Littorio airport, Rome, at which most of the Italian constructors were represented. Judging by the interest shown, the Italian public appears to be increasingly attracted by the light 'plane movement and civil aviation generally.

Civil Aerodromes at Bologna and Messina

AERODROMES, primarily for private flying, have been established at Bologna and Messina.

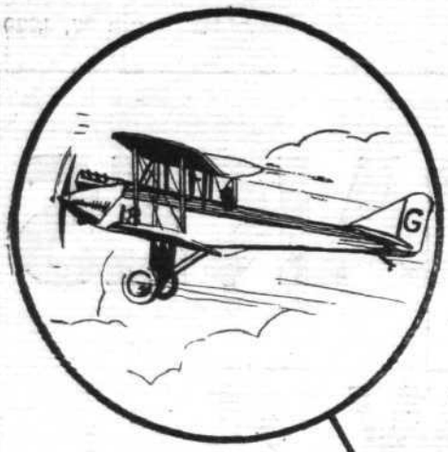
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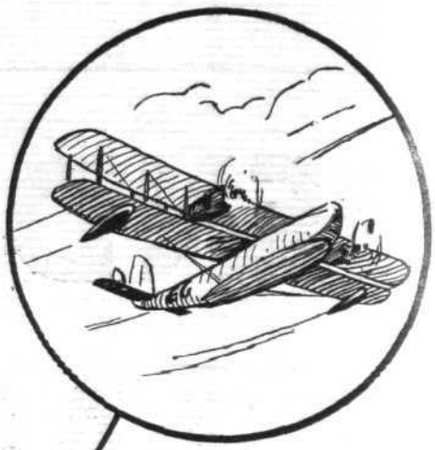
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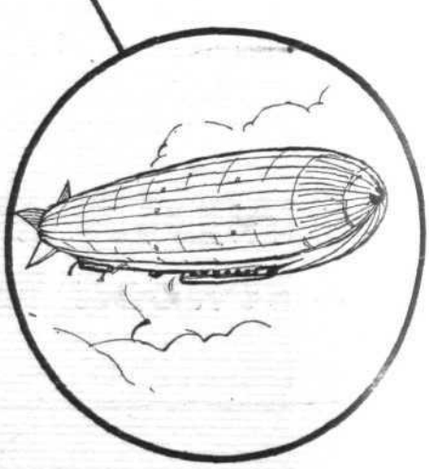
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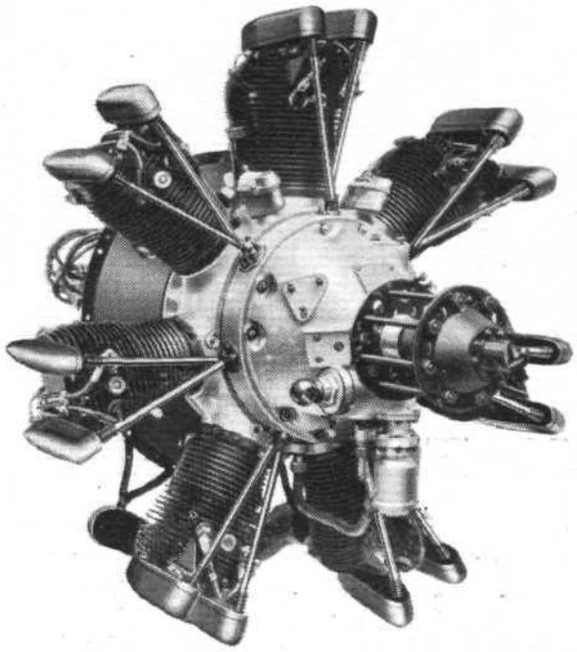




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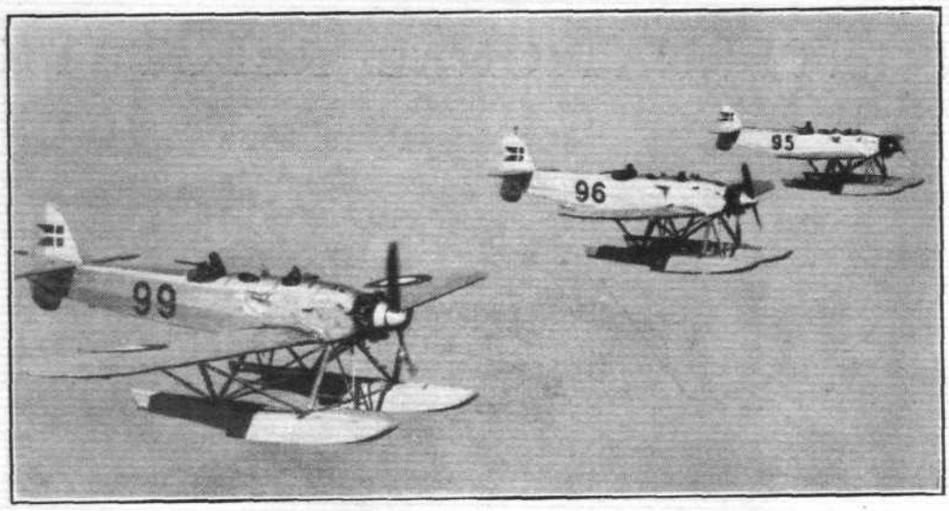
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GREAT FLIGHT BY GEARED JAGUARS

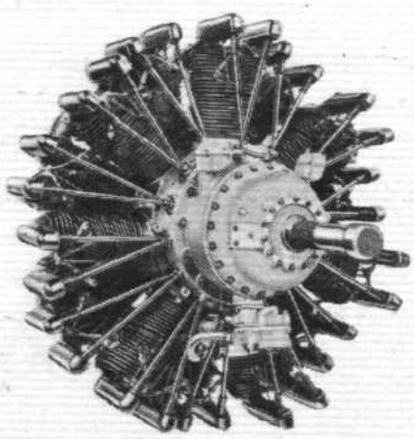
A FLIGHT of Heinkel seaplanes fitted with 460-500 h.p. Geared Jaguars recently flew from Denmark to Barcelona and back. At the end of the flight it was stated "the engines ran like a clock the whole way."

Geared Jaguars are being used on the latest Imperial Airways Airlines. For greatest smoothness and best performance specify the

GEARED JAGUAR

14 cyls.

460–500 H.P.



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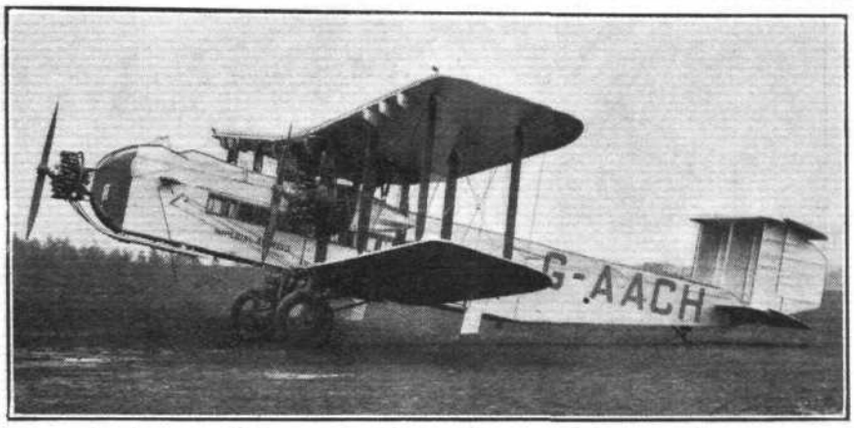
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3 YEARS. 7,000 HOURS. 630,000 MILES

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Air Endurance	3½ hours	
Useful Load	5,000 lbs.	2,273 kgs.
Petrol	250 gallons	1125 litres
Oil	21 gallons	94.5 litres

AERO EXHIBITION
OLYMPIA
JULY 16TH TO 27TH

STAND
87

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THE all-steel Atlas is the best aircraft for land or sea reconnaissance.

It is the standard Army Co-operation two-seater of the Royal Air Force.

Its steel construction accounts for its unrivalled durability and ease of maintenance. Fitted with the world-famous Armstrong Siddeley Jaguar engine (plain or geared type), its speed, climb and ceiling fulfil the severest Service requirements. It is produced on the grand scale by the best equipped aircraft works in Europe.

PERFORMANCE FIGURES

ATLAS WITH JAGUAR ENGINE AND TOWNEND RING

Fuel, 75 gallons (337.5 litres). Oil, 7 gallons (31.5 litres). Military Load, 880 lbs. (400 kgs.)

	Plain Engine.	Geared Engine.
Approx. total weight	4000 lbs.	4115 lbs.
	1820 kgs.	1870 kgs.
Speed at ground level	143.5 m.p.h.	149 m.p.h.
	231 km.p.h.	240 km.p.h.
" " 5000 ft.	139.5 m.p.h.	145 m.p.h.
" " 10000 ft.	134 m.p.h.	140 m.p.h.
" " 15000 ft.	125 m.p.h.	131 m.p.h.
" " 1000 metres	226 km.p.h.	236 km.p.h.
" " 3000 metres	216 km.p.h.	225 km.p.h.
" " 5000 metres	193 km.p.h.	204 km.p.h.

	Plain Engine.	Geared Engine.
Time to 5000 ft.	5.25 minutes	4.25 minutes
" " 10000 ft.	12.5 "	10.5 "
" " 15000 ft.	26 "	21.75 "
" " 1000 mtrs.	3.5 "	2.5 "
" " 3000 "	12.5 "	10.25 "
" " 5000 "	34 "	27.5 "
Absolute Ceiling	19000 ft.	19100 ft.
	5800 metres	5830 metres
Service Ceiling	17300 ft.	17700 ft.
	5280 metres	5400 metres

Maximum allowable R.P.M. 2200. Normal R.P.M. 2000

AERO EXHIBITION, OLYMPIA. JULY 16 to 27. STAND 87

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The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

June 27, 1929

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EDITORIAL VIEWS.

The subject of single-spar cantilever wings is one which is well to the fore just at the present time, due largely to the recent introduction of the Stieger mono-spar form of wing construction. As is so often the case when a strikingly new departure is brought forward, opinions are divided as to the merits or otherwise of such a form of structure, some seeing in the new wing an enormous step forward in aircraft structural efficiency, while others hold that the gain to be expected may be a good deal less than is now apparent; at least the system is untried, and has not yet had an opportunity to prove itself. It is certainly of interest to examine the possibilities of the single-spar wing, and in the present issue we publish an article by Mr. F. Duncanson, of the Technical Staff of the Gloster Aircraft Co., dealing with a method of calculating the wing torsion, size of torque member and angular distortion to be expected in a cantilever wing in which the loading occurred at a centre of pressure position somewhat remote from the main spar.

It will be seen that Mr. Duncanson has taken for his subject a single spar composed of an I-beam to take the bending loads, and that he has surrounded this I-beam with a tubular tapering torque member. Thus, structurally, Mr. Duncanson's wing differs materially in detail from the Stieger wing, although results of a comparable order are obtained as regards wing weight. One outstanding result of Mr. Duncanson's examination of the subject is that the intensity of stress in the torque member is low because the amount of material to be put into the torque member is decided mainly by the requirements of stiffness. He finds that this does not necessarily mean a heavy torque member, as a conical circular-section tube is a very efficient transmitter of torque.

With the Schneider Trophy Contest approaching, considerable interest naturally attaches to the design of racing seaplanes, and this month Mr. Carter returns to the subject with an article on a tandem air-cooled engine design. Mr. Carter arrives at the result that, although the tandem engine machine is naturally not as efficient as the single-engined, the use of existing power plants in tandem may be expected to give a gain in speed of about 17 per cent.

CANTILEVER WINGS

An Investigation of Torsional Strength and Stiffness

By F. DUNCANSON, B.Sc., Wh.Ex.

In the AIRCRAFT ENGINEER of March 28, 1929, a method of estimating the amount of material necessary to resist the bending moments and shear forces imposed normally to the chord of a cantilever wing was proposed and in order to confine the problem to one of pure bending, the case of a wing with a stationary C.P. was chosen.

In any case, adequate torsional stiffness must be provided to guard against wing flutter and to avoid undue distortion under the loads imposed by full use of the ailerons. It is also desirable to legislate for wing sections which have definite C.P. movements under varying conditions of flight.

The object of the present article is to consider a method of calculating the wing torsion, size of torque member and angular distortion that would occur in the case of a cantilever wing subjected to loading at a C.P. position remote from the main spar.

The form of torque member that lends itself best to simple mathematical treatment is of circular cross section and of small thickness/diameter ratio. We will consider a torque member of this form, inserted in the wing section at its maximum thickness—about 0·3 chord—and as the wing under consideration is of tapered formation, of constant thickness/chord ratio, the shape of the torque member will be conical, the diameter at any point along the wing span being defined by a simple mathematical expression, as was the case with the spar depth in the previous investigation.

Fig. 1 illustrates a section through the wing, in which is combined the conical torque member above described and the spar considered in the previous article, both at or in the neighbourhood of the maximum thickness of the wing.

The combination thus arrived at constitutes a single spar arrangement which in practice has been found to give very satisfactory results. There are, naturally, many different ways in which the scheme could be carried out in detail, but at the present stage we are not concerned so much with details of construction as with a method of ascertaining the amount of material necessary to resist the torque imposed on the wing.

It is inevitable that the torque member will be subjected to the general bending strain of the wing and will therefore have combined direct and shearing forces imposed on its material, but it will also take a certain share of the bending moment and thus relieve the main spar. As will be seen later, the criterion of the quantity of material required to be put into the torque member is dependent more on the

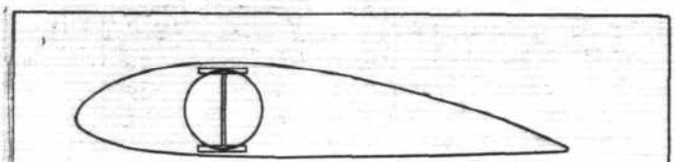


FIG. 1.

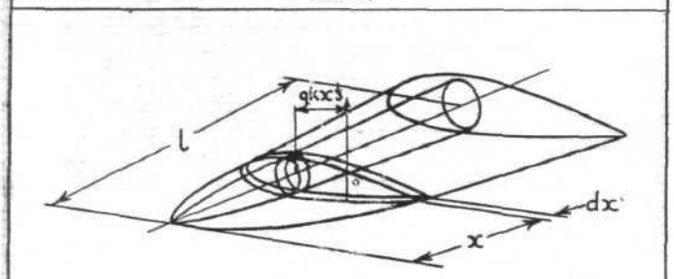


FIG. 2.

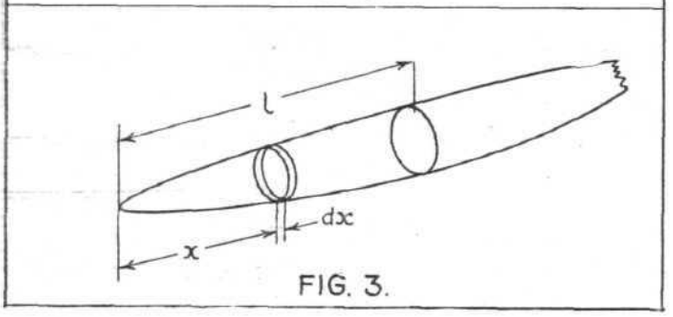


FIG. 3.

requirements of stiffness than on the limiting stress in the material, so that the added stress due to bending is of very little consequence.

Adopting the same notation as in the previous article :—

Let W = the central load.

A = total wing area.

N = load factor.

L = loading per unit area $= \dfrac{NW}{A}$

x = Any distance measured along the wing span from the tip of one wing.

l = semispan.

k = a coefficient such that $kx^{\frac{1}{2}}$ = chord at any position, x, from the wing tip $\left(k = \dfrac{2}{5}\,l^{\frac{1}{2}}\right.$ for aspect ratio of $6\frac{2}{3}\left.\right)$.

D = spar depth or diameter of torque member.

c = ratio of D to wing chord.

ρ = weight per cubic foot of the material = 500 lbs. for steel.

t = thickness of material used for torque member.

fs = shear stress.

T = torque.

I_0 = polar moment of inertia of the section of the torque member.

r = distance of outermost fibre from the centre of the torque member section, which in the present case is $\dfrac{D}{2}$.

G = "modulus of rigidity," or shear modulus of the material.

= 1728×10^6 lbs. per square foot for steel.

θ = angle of twist of the wing in radians.

w_t = weight of torque member.

Now, let q = a coefficient which, multiplied by the chord, gives the distance of the C.P. from the torque member, which is placed at 0·3 chord; q is taken to be constant, which assumption is nearly true for small angles of twist.

Referring to Fig. 2 :—

Element of torque, dT = Load × Arm

$= Lkx^{\frac{1}{2}}\,dx \times qkx^{\frac{1}{2}}$

The expression for the torque at any point, x, from the wing tip is $T = Lqk^2\int x^{\frac{1}{2}}\,dx$

$$\therefore\ T = \frac{3}{5}\,Lqk^2\,x^{\frac{5}{2}} \qquad \ldots\ldots (1)$$

According to the elementary principles of torsion on cylindrical shafts :—

$$\frac{I}{I_0} = \frac{fs}{r} = \frac{G\theta}{x} \qquad \ldots\ldots (2)$$

$$\therefore\ I_0 = \frac{Tx}{G\theta} \qquad \ldots\ldots (3)$$

The polar moment of inertia, I_0, of a thin walled cylindrical section of thickness t and diameter D is approximately :— cross-sectional area × (mean radius)², as t is small compared with D,

$$I_0 = \pi Dt \times \frac{D^2}{4} = \frac{\pi}{4}\,D^3t$$

but $D = ckx^{\frac{1}{2}}$

$$\therefore\ I_0 = \frac{\pi}{4}\,c^3k^3t\ \ x \qquad \ldots\ldots (4)$$

From (2) :—

$$\theta = \frac{Tx}{I_0G}$$

$$d\theta = \frac{T}{I_0G}\,dx$$

Substituting the general expressions for T and I_0 from (1) and (4) :—

$$d\,\theta = \frac{4 \times 3}{5}\,\frac{Lqk^2x^{\frac{5}{2}}}{G\pi c^3k^3xt}\,dx = \frac{12}{5}\,\frac{Lq}{G\pi c^3kt}\,x^{\frac{3}{2}}\,dx$$

The total twist from wing tip to wing root may now be found by integrating this expression between the limits of $x = o$ to $x = l$.

$$\theta = \frac{12}{5}\,\frac{Lq}{G\pi c^3kt}\int_0^l x^{\frac{3}{2}}\,dx$$

$$\theta = \frac{36}{25}\,\frac{Lq}{G\pi c^3kt}\,l^{\frac{5}{2}}$$

Substituting for k : $\theta = \dfrac{18}{5}\,\dfrac{Lq}{G\pi c^3t}\,l$ $\qquad \ldots\ldots (5)$

This expression gives the general relationship between the angle of twist and the geometrical proportions of a tapered tubular torque member. We find that θ is :—

Directly proportional to the loading and the distance of the C.P. from the spar.

Directly proportional to the span of the wing.

Inversely proportional to the shear modulus of the material and to the thickness of the tube.

Inversely proportional to the cube of the wing thickness.

From (5) :—

$$t = \frac{18}{5}\,\frac{Lql}{\theta G\pi c^3} \qquad \ldots\ldots (6)$$

We may now proceed to find the weight of the torque member. Referring to Fig. 3 :—

Cross sectional area, $a = \pi Dt. = \pi ckx^{\frac{1}{2}}\,t.$

Volume of one-half of torque member $= \pi ckt\int_0^l x^{\frac{1}{2}}\,dx$

$$= \frac{3}{4}\,\pi ckt\,l^{\frac{3}{2}}$$

Weight of complete torque member, $w_t = \dfrac{3}{2}\,\rho\pi ktl^{\frac{3}{2}}$

Substituting the value of t from (6) :—

$$w_t = \frac{3}{2}\cdot\frac{\rho\pi ck \cdot 18Lql \cdot l^{\frac{3}{2}}}{5\ \theta G\,\pi\,c^3}$$

$$= \frac{27}{5}\,\rho\,\frac{kLql^{\frac{5}{2}}}{\theta G\,c^2}$$

Substituting for k :—

$$w_t = \frac{54}{25} \frac{\rho L q}{\theta G c^2} l^3 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (7)$$

To find the shear stress :—

$$\text{from (2)} \qquad f_s = \frac{Tr}{I_0}$$

Putting in the values of T and I_0 from (1) and (4) and making $r = \frac{1}{2} ckx^3$, we find :—

$$f_s = \frac{1}{3} \theta G c \cdot \frac{x}{l}$$

This is a maximum when $x = l$ and is $f_{s\,max} = \frac{\theta G c}{3}$ (8)

Examples.

Taking the second example of the previous article, in which the central load was 4,000 lb., the other particulars being :— $\frac{W}{A} = 12$ lb. per square foot, $l = 23 \cdot 59$ ft., suppose the C.P. position at top speed to be 0·5 chord.

q will then be $0 \cdot 5 - 0 \cdot 3 = 0 \cdot 2$.

If we stipulate that the angular distortion under normal load is not to exceed 1 deg. at the wing tip,

$$i.e., \quad \theta = \frac{1}{57 \cdot 3} \text{ radians,}$$

then the weight of the torque member necessary to fulfil these conditions will be :—

$$w_t = \frac{54}{25} \times \frac{500 \times 12 \times 0 \cdot 2 \times 57 \cdot 3}{1{,}728 \times 10^6 \times 0 \cdot 125^2} \times 23 \cdot 59^3$$
$$= 72 \cdot 5 \text{ lb.}$$

The maximum shear stress is :—

$$f_{s\,max} = \frac{1}{3} \cdot \frac{1{,}728 \times 10^6 \times 0 \cdot 125}{57 \cdot 3}$$
$$= 1{,}258{,}000 \text{ lbs./sq. ft.}$$
$$= 3 \cdot 9 \text{ tons per square inch.}$$

Thus we see that if the torque member is designed to give reasonable torsional stiffness to the wing, the actual torsional stress is comparatively low. This does not necessarily mean that excessive structural weight is involved, as, owing to the inherent efficiency of the thin circular-section conical tube as a torque member, the weight is comparatively small ; in the example chosen, for instance, this is about half the weight of that part of the structure required to resist pure bending. Each particular design involves its own load factors and requirements regarding torsional stiffness, so that it is impossible to give a definite relationship between the weight of the spar and the weight of the torque member, but once the requirements are known, the suggested methods enable a rapid approximation to be made of the main structural members of a cantilever wing.

AIR-COOLED HIGH-SPEED SEAPLANES

By W. G. CARTER, M.B.E.

In a discursive examination of the relative merits of air *v.* water-cooled racing machines, it may be considered that the ultimate justification for developing either type is contingent upon the degree in which the most successful practice may be applied to the requirements of progressive design.

Not inconsistent with this principle is the necessity to segregate those characteristics providing an advantage for racing purposes, while subject to depreciation or entirely discounted when dissociated from that special and particular concept.

The most significant item for consideration in this respect is the procedure adopted for dissipating surplus heat from water-cooled engines by using a comparatively large expanse of superficial radiating surface, this arrangement conferring an advantage amounting to six or seven per cent., but unsuitable in many respects for service and general-purpose machines, a tube block radiator with its accompanying high resistance being a standard fitment under these conditions.

In all other respects, alternative types compete on terms of equality, the disparity between frontal areas of respective engines being the principal contributing factor in determining relative speed values.

By rearrangement of engine accessories it has been possible to reduce the frontal area of water-cooled units within normal requirements of sufficient fuselage accommodation for pilot, fuel tanks and equipment.

Similar treatment and modification is not so readily applicable to radial engines, the frontal area of which, in addition to greatly exceeding "V," or similar units, is of such configuration or shape precluding the possibility of a body system comparable in outline with competitors. The effect of these matters in relation to speed values has formed the subject of comparative experiment and investigation on different occasions ; the resulting evidence, however, has frequently been insufficiently convincing, or in other respects inconclusive, and there accordingly exists a wide divergence of opinion not unusually somewhat exaggerated in favour of water-cooled installations.

One of the more recent designs constructed for this purpose was fitted with an air-cooled Bristol "Mercury" engine, each cylinder projecting through the fuselage and individually faired with suitable covers having apertures at each extremity for cooling purposes. The governing factors prescribing a layout according to this conception were (1) the necessity to provide a good degree of visibility ; and (2) the restricted diameter of the airscrew blades due to high R.P.M. of an ungeared engine.

An officially-timed speed test returned an average of 232 m.p.h., with a maximum brake horse-power of 650, and 2,175 r.p.m., instead of 2,500, for which the airscrew was designed, the thrust horse-power under these conditions not exceeding 520, and implying a resistance of 72·5 lbs. for the complete machine.

After certain modifications had been made in regard to position, area and shape of the air intake, a considerable improvement in available brake horse-power was obtained. By that time, however, the special metal airscrews were unserviceable, and those constructed in timber and in use as a temporary expedient gave, as was expected, results of no comparative value.

It is interesting to reflect that a quarter-scale model of this machine, subjected to experiment and research at the N.P.L. had, under conditions of close similarity, predicted a resistance of round about 70 lbs.—a somewhat remarkable verification, in view of possible scale effect in reproducing a body system of this arrangement. A comprehensive survey of this work has been published, and, having regard to authenticity of agreement between model and full scale, will serve as an authoritative index in considering alternative methods of installing an engine to the best advantage.

The minimum drag recorded by successive observation with different shapes and types of engine cowling proved to be 65·5 lbs., occurring in association with extremely elongated covers fitted to the projecting cylinders. Considering this problem from an opposite standpoint, evidence is not unavailable in support of an opinion that entirely to enclose the engine within a fuselage diameter may prove a solution for reducing drag to a minimum value, this arrangement being particularly suitable when regarding the fuselage as an engine nacelle, and accommodation for the pilot, with the necessary range of visibility, is provided elsewhere.

A possible method of installation under these conditions is to superimpose a fairing of adequate size about the normal fuselage surface, providing, in effect, an annular space in which repose the cylinder extremities. To ensure a steady and continuous supply of air at relatively low velocity passing through this concentric area, an orifice is formed by means of a duplex spinner attached to the airscrew, or alternatively by a small enlargement of the external cowling immediately

behind a spinner of normal type, the heated air being deflected through the outer fairing, or discharged through an aperture towards the rear end of the structure, disposal of engine exhaust gases to avoid any possibility of escape into the annular space requiring special attention in order to determine the most suitable method of extraction.

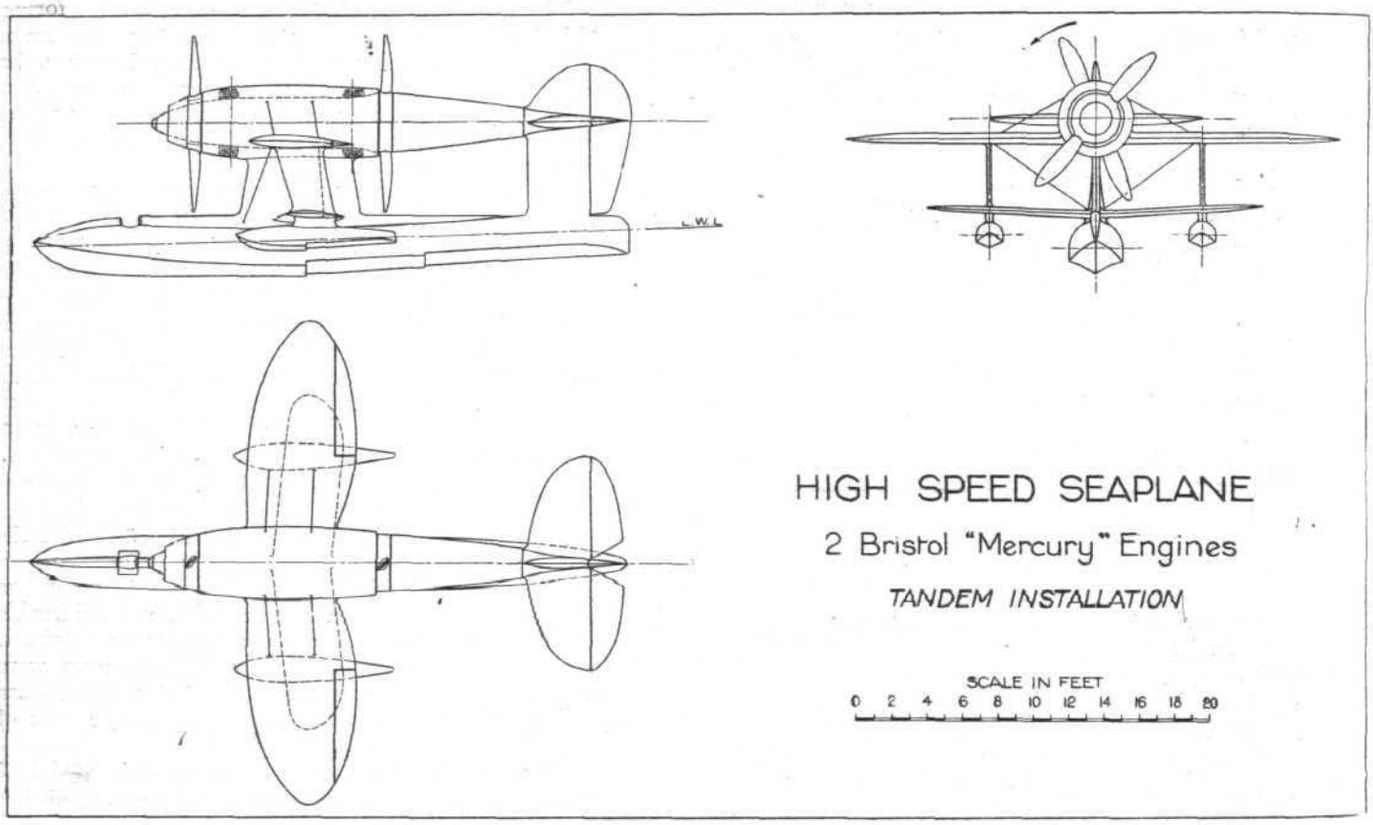
The spinner annulus, provisionally arranged in this case to provide an area of 1·4 sq. ft., is sufficient to admit some 600 cub. ft. of air per second, and a fuselage diameter of 4·3 ft. provides an outline of excellent shape, the cross-sectional area of which, excluding that of the central orifice, is 13·5 sq. ft.

Computing drag according to data derived from the model with cylinder projections removed, and from other sources, it may be shown that a figure of 17·5 lbs., increasing to 22 lbs. with the internal resistance, is a reasonable assumption, a total for the complete machine being approximately 52 lbs.—a difference of 28 per cent. in favour of this arrangement in comparison with the former.

mately 10 sq. ft. and the corresponding drag estimated to be 13 lbs. Resistance of the variable cowlings having been assumed according to degree, an estimate of 23 lbs. increasing to 27 lbs. due to cooling effects may be considered reasonable, making a total of 57 lb. for the complete machine and indicating a close average between extreme types—a rational hypothesis apart from other considerations.

A general summary is appended, together with an average example of water-cooled racing machine, in order that a direct comparison may be formed in this respect.

In view of the benefit derived from surface radiators, not transferable to general requirements, it should be observed in appraising the tabulated values that the radial-engined installation is directly applicable to air-cooled machines without appreciably increasing their resistance. An opinion therefore, that a programme of high-speed development is incomplete with radial engines excluded from active competition is by no means inconsistent with a critical examination of data in this respect.



Mr. Carter suggests that a reduction in drag of air-cooled engines is possible by using annular space around cylinders.

It is important in this connection to obtain an airscrew of sufficient diameter in order to diminish excessive interference losses unavoidable with this design in combination with an ungeared racing engine; some form of reduction gear is therefore essential when the R.P.M. exceed 2,000.

An interesting compromise between these extremes is an arrangement involving a special type of gearing, offsetting the airscrew some 4 in. below centre line of engine crankshaft, the normal interference between cylinder projections due to their proximity thereby being progressively reduced towards the fuselage underside, while visibility from the cockpit is not unduly restricted for racing purposes.

To compute accurately the resistance of this arrangement without recourse to wind tunnel experiment is impracticable. An approximation may, however be derived by reference to the N.P.L. report, in which case all projections were removed excepting the top extension forming a shield or protection for the pilot's head, the resulting cross-sectional area of 6·5 sq. ft. indicating a drag of 8·5 lbs. or 1·3 lbs. per sq. ft., the resistance of each cylinder cowling when separated from the remainder being ·85 lbs. per unit, increasing to 2·35 lbs. per unit with all in position.

The area of fuselage and top fairing extension is approxi-

An arrangement of engines in tandem formation being a logical development for ultra-high-speed seaplanes, some special attention must be given to the large expanse of unfaired area behind the rear unit, when entirely enclosed within a fuselage diameter.

In order to avoid fitting a tail spinner of prohibitive dimensions, a non-rotating conical extension as shown in the outline drawings is suggested as a means for providing continuity of outline, the apex of the cone being supported from the tail plane, and the larger end on an extension of the air-screw shaft, by means of a self-aligning support of suitable design spigoted in the base, and ensuring flexibility without appreciably increasing load on the airscrew shaft or supports.

Cooling is effected by fitting dual fairings having appropriate divisions or ducts, admitting air at an initial temperature common to each cylinder, heated air being extracted by slightly reducing the rear airscrew boss extension from the fuselage diameter immediately adjacent, a diaphragm attached to the airscrew boss and provided with suitably arranged vanes adjoining the rear orifice inducing a continuous current of air through the annular space for this purpose.

A general description of a similar boat having water-cooled engines has been given in FLIGHT of February 28, and the



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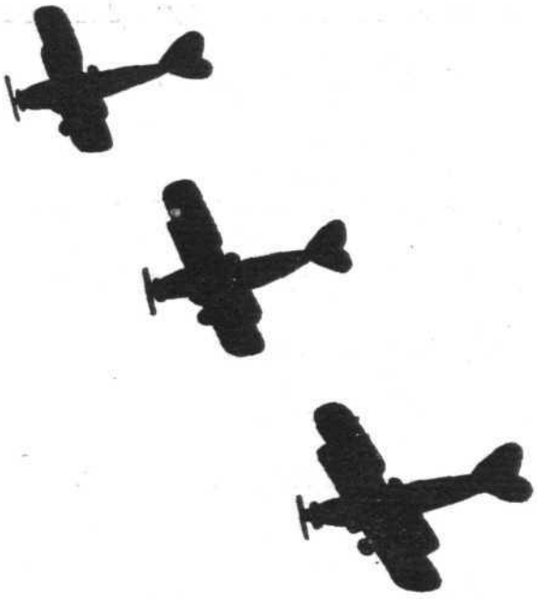
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THOS FIRTH & SONS LTD SHEFFIELD

Summary of Data.

Item.	Condition of Test.	Resistance of Complete Machine (lbs.). Full Scale.	Model Test.	Computed.	Resistance corrected for reduced Wing Area.	Estimated Speed* (825 T.H.P.). m.p.h.	*Percentage of 317 m.p.h.	Remarks.
I	Test flight with 520 T.H.P.	72·5	70·0	—	—	270	85·0	Speed computed according to full-scale resistance.
II	As (I) but with wing area equivalent to stalling speed of competing machines	72·5	—	—	68·5	276	87·0	Wing area reduced from 120 sq. ft. to 90 sq. ft.
III	As (II) but with cylinder cowls elongated from 2½ to 1 ratio to 4 to 1 ratio	—	65·5	68	64·0	282	89·0	Interference effect probably constant, but individual resistance of cowlings is less.
IV	With fuselage completely enclosing engine, together with reduced wing area	—	—	52	52·0	302	95·2	Visibility for pilot insufficient. Suitable for engine mounted in nacelle only.
V	With offset airscrew centre and cylinder projections of diminishing size	—	—	57	57·0	293	92·5	Airscrew countershaft arranged about 4 ins. below crankshaft centre line. Good visibility.

* *See* "High-Speed Seaplanes" (THE AIRCRAFT ENGINEER, February 28).

following tabulated values are submitted as an equitable approximation easily determinable by observation on comparative models of similar scale.

Item.	Tandem Water-cooled.	Tandem Air-cooled.
All up weight	5,500 lbs.	4,600 lbs.
Area main planes	177 sq. ft.	148 sq. ft.
Resistance—		
Nacelle and top plane	19·8 lbs.	33·0 lbs.
Boat and tail unit	15·3 ,,	14·0 ,,
Lower plane and auxiliary floats	8·7 ,,	7·5 ,,
Struts and bracing	12·2 ,,	11·5 ,,
Total (100 ft. per second)	56 lbs.	66 lbs.
B.H.P. Two engines	1,940	1,940
T.H.P. ,,	1,650	1,650
Lbs. per B.H.P.	2·83	2·36
Range full throttle	250 miles	250 miles
Duration full throttle	40 mins.	40 mins.
Stalling speed	105 m.p.h.	105 m.p.h.
Maximum speed	372 m.p.h.	352 m.p.h.
As percentage of water-cooled	100	95

According to this analysis a tandem-engined boat of either type provides an advantage in speed of some 17 per cent. in comparison with a single-engined machine having 20 per cent. less drag and a similar engine, or alternatively is equivalent to a single-engined machine with a power unit of 77 per cent. of the combined output of two engines in tandem.

Note.—Resistance estimated at 100 ft. per second unless otherwise stated.

THE HYDRODYNAMICAL EFFICIENCY OF FLYING-BOAT HULLS AND SEAPLANE FLOATS.

By J. H. LOWER, A.F.R.Ae.S., A.M.I.N.A.

When carrying out tank tests with models of flying-boat hulls and seaplane floats, some convenient notation is required whereby the efficiency of various forms may be compared, and it has been found that the ratio $\frac{\text{load on water}}{\text{resistance}}$ is a suitable expression.

The "load on water" at any speed is derived by subtracting the lift of the planes from the at-rest displacement of the hull or floats (which is the all-up weight of the machine), and dividing this "load on water" by the water resistance at the speed under consideration, results in a non-dimensional efficiency factor being obtained.

It is obvious that this $\frac{L}{R}$ ratio varies with speed, and typical curves that may be expected are shown in Fig. 1. These curves were obtained from actual tank tests with models of well-known hulls and floats, and have been plotted to a convenient base, while in Fig. 2 typical resistance curves have been similarly treated.

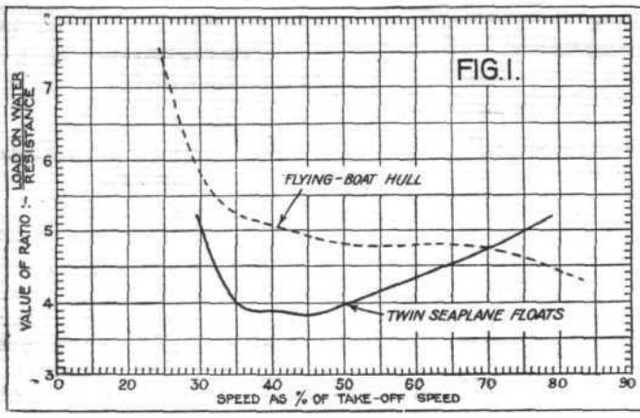
It is usually found that the respective $\frac{L}{R}$ curves for flying-boat hulls and seaplane floats assume opposite slopes as 60 to 70 per cent. of the take-off speed is reached, the former showing a tendency to approach zero, while the latter tend to approach infinity. Since at the take-off speed the ratio $\frac{\text{load on water}}{\text{resistance}}$ becomes $\frac{0}{0}$, it is of interest to consider the curves in the two cases separately.

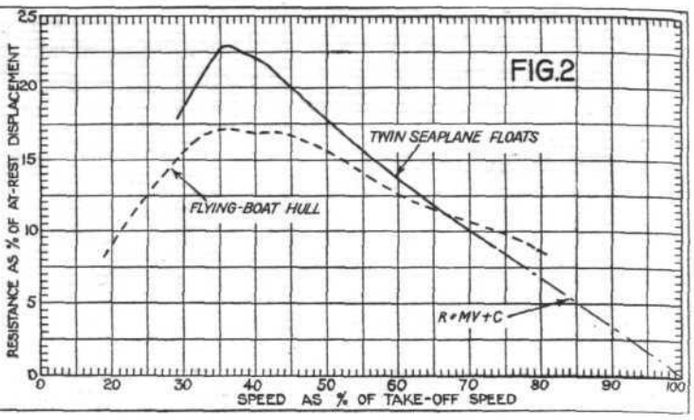
It would appear that as the take-off speed is approached, the resistance curve for seaplane floats approximates to a straight line, and we will assume that this follows the law—

$$R = mV + c$$

where

R = the water resistance
V = speed under consideration
m and c = constants.





If the lift of the planes be assumed proportional to (speed)^2, then the "load on water" (L) at any speed V is given by

$$L = W\left(1 - \frac{V^2}{V_0^2}\right)$$

where

W = at-rest displacement (all-up weight of machine)
V_0 = take-off speed.

Taking the ratio $\frac{\text{load on water}}{\text{resistance}} = f$

then

$$f = \frac{W\left(1 - \frac{V^2}{V_0^2}\right)}{mV + c}$$

$$= \frac{W}{V_0^2}\left(\frac{V_0^2 - V^2}{mV + c}\right)$$

and

$$\frac{df}{dV} = \frac{W}{V_0^2}\left\{\frac{(mV + c)\ (-2V) - m\,(V_0^2 - V^2)}{(mV + c)^2}\right\}$$

$$= -\frac{W}{V_0^2}\left\{\frac{mV^2 + mV_0^2 + 2cV}{(mV + c)^2}\right\}$$

also

$$\frac{d^2f}{dV^2} = -\frac{W}{V_0^2}\left\{\frac{(mV + c)^2\,(2mV + 2c) - (mV^2 + mV_0^2 + 2cV)\,(mV + c)\,(2m)}{(mV + c)^4}\right\}$$

$$= -\frac{W}{V_0^2}\left\{\frac{2\,(c^2 - m^2V_0^2)}{(mV + c)^3}\right\}$$

$$= \frac{2W}{V_0^2}\left\{\frac{m^2V_0^2 - c^2}{(mV + c)^3}\right\}$$

$$= \frac{2W}{V_0^2}\left\{\frac{m^2V_0^2 - c^2}{(mV_0 + c)^3}\right\} \text{ when } V = V_0$$

Substituting

$$c = KV_0$$

$$\frac{d^2f}{dV^2} = \frac{2W}{V_0^2}\left\{\frac{m^2V_0^2 - K^2V_0^2}{(mV_0 + KV_0)^3}\right\}$$

$$= \frac{2W}{V_0^3}\left\{\frac{(m + K)}{m - K^2}\right\} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

It is clear that the slope of the straight line resistance curve gives a negative value for "m," with the result that the expression in equation (1) is also negative, showing that the $\frac{L}{R}$ curve in this case approaches infinity as the take-off speed is reached.

In "An Investigation into the Take-off of Flying Boats," by A. Gouge, B.Sc., A.F.R.Ae.S. (FLIGHT ENGINEERING SUPPLEMENT, November 24, 1927), it was shown that the water resistance curve in the case of flying-boat hulls approximated to the law

$$R = qW\left(\frac{V}{V_0} - \frac{V^2}{V_0^2}\right)$$

where q = a constant depending on the hull shape.

Taking then as previously the "load on water" at speed V to be

$$L = W\left(1 - \frac{V^2}{V_0^2}\right)$$

we have

$$\frac{L}{R} = f = \frac{W\left(1 - \frac{V^2}{V_0^2}\right)}{qW\left(\frac{V}{V_0} - \frac{V^2}{V_0^2}\right)}$$

$$= \frac{V_0^2 - V^2}{qV\,(V_0 - V)}$$

$$= \frac{V_0 + V}{qV}$$

And

$$\frac{df}{dV} = \frac{1}{q}\left(-\frac{V_0}{V^2}\right)$$

while

$$\frac{d^2f}{dV^2} = \frac{2V_0}{qV^3}$$

$$= \frac{2}{qV_0^2}, \text{ when } V = V_0 \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

The expression in equation (2) is a positive quantity, showing that if the resistance curve follows the law $R = qW\left(\frac{V}{V_0} - \frac{V^2}{V_0^2}\right)$, then the $\frac{L}{R}$ curve approaches zero as the take-off speed is reached.

Flying-boat hulls are more efficient than twin seaplane floats for the major portion of the speed range during the take-off run, and it would appear that if, with the former type, the resistance curve beyond the "hump" speed can be made to approximate to a straight line law, an additional advantage will be obtained.

THE TAIL PLANE AREA TO GIVE LONGITUDINAL STABILITY.

[By W. R. ANDREWS, Higher National Diploma (Hons.).

Many attempts have been made to express in a convenient formula the size of tail plane to give longitudinal stability.

Consistent results cannot be expected from a formula which takes into account only the moment of area, as the aerodynamic properties of the main planes and tail plane play an equally important part.

By making a few justifiable assumptions one can arrive at a sufficiently accurate relationship of the tail area to the geometry of the aircraft and the non-dimensional coefficients representing the aerodynamic qualities.

Between the stable and the unstable region is one known as "neutrally stable." In this region a large speed range is possible without necessitating a change of trim.

FIG 1

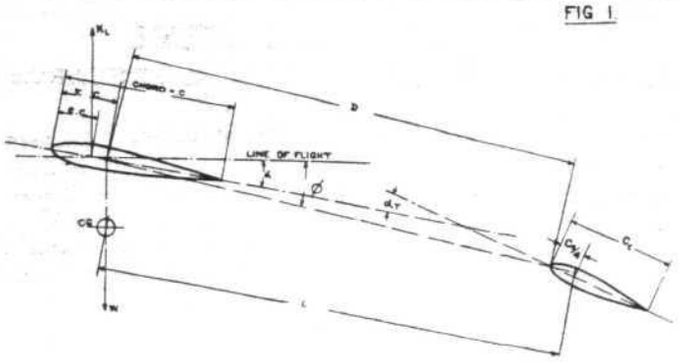


Fig. 2 gives the tail setting required to trim for an aircraft with the C.G. arranged to give: (1) Stability, (2) Neutral stability, and (3) Instability.

Consider the aircraft in steady flight at a speed A, now reduce the speed to B without altering the tail setting. The machine is still in trim in case 2 but is out of trim in cases 1 and 3. In case 1 the tail will be set too positively and the machine will tend to dive until it again reaches speed A, when it will continue in steady flight as before.

In case 3, however, the tail setting at the reduced speed will be too negative and the machine will tend to climb and cause a further reduction of speed and will eventually lead to stalling.

This latter condition is, of course, an undesirable feature in civil aircraft although it may be necessary to a small degree in special cases in order to obtain manœuvrability.

It is a well-known fact that if a machine is neutrally stable at small angles of attack it is invariably stable at larger angles.

The fact that no change of trim takes place in the neutrally stable region gives a convenient starting point for a mathematical treatment of the problem.

The most important assumption made is that the drag of the whole aircraft acts at the centre of gravity and has, therefore, no influence on the tail load. For a normal biplane this is approximately correct, and generally the moment of drag is so small compared with the moment of lift, &c., that the assumption is justified.

It is also assumed that the lift coefficient curve is proportional to incidence at small angles of attack and that the moment coefficient about the leading edge of the wing is roughly a straight line when plotted against the lift coefficient.

This latter assumption is stated as above because the usual conception of moment is that about the leading edge. Actually this is slightly altered for the purpose of the article, and a point on the chord is chosen where the moment coefficient is constant and has a value of K_{m0} which is the moment at no lift. The position of this point expressed as a fraction of the chord is given by the slope of the moment curve about the leading edge.

So that if the moment with respect to the leading edge is :—

$$K_m = -eK_L + K_{m0} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Then the point about which the moment is constant is e times the chord back from the leading edge.

Theory suggests that the value of e should be 0·25, actual values as measured in the wind tunnel vary slightly from this but for any section whose characteristics are not known it is safe, for a monoplane, to use this figure.

The value of e is taken as being independent of Aspect Ratio, but changes from monoplane to biplane as a function of the gap-chord ratio, thus :—

$$e\,(\text{biplane}) = e\,(\text{monoplane})\left[1-\tfrac{1}{8}\left(\frac{c}{g}\right)^2\right] \quad \ldots\ldots\ldots (2)$$

where

c = Mean chord in feet.

g = Gap in feet.

The definition of mean chord (for moments) of a biplane is

$$c = \frac{S_{W1}c_1 + S_{W2}c_2}{S_{W1} + S_{W2}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

where S_{W1} and S_{W2} represent the areas of top and bottom planes and c_1 and c_2 the corresponding chord.

If the ratio of the lift coefficients of upper and lower wing is given by

$$\frac{K_L \text{ Upper}}{K_L \text{ Lower}} = r$$

then the height of the equivalent chord above the mean chord of the bottom plane is

$$\bar{y} = g\left(\frac{r\,S_{W1}}{r\,S_{W1} + S_{W2}}\right) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

where g is the gap between the mean planes.

The fore and aft position of the equivalent chord is determined by the position of $e.c.$ The points $e_1 c_1$, $e\,c$ and $e_2 c_2$ must be on a straight line.

Having fixed the equivalent plane the necessary conditions for stability can now be investigated.

From considerations of lift and moments only the moment of the wings about the C.G. at small angles of incidence can be expressed by :—

$$M_W = q \cdot S_W c\,[(x-e)\,K_L + K_{m0}] \quad \ldots\ldots\ldots\ldots\ldots\ldots (5)$$

where $q = \sigma \cdot \rho \cdot V^2$

and $xc.$ is the distance measured parallel to the wind direction between the leading edge of the equivalent plane and the C.G.

The moment of the tail plane (considered as all elevator) about the C.G. is

$$M_t = q \cdot S_t \cdot L.K_y \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

where K_y is the tail-lift coefficient and "L" is the tail arm measured parallel to the chord. (*See* Fig. 1.)

For steady flight the moment of the tail must balance the moment of the wings in all cases, *i.e.* :

$$M_W = M_t$$

from which we obtain

$$K_y = \frac{S_W}{S_t} \cdot \frac{c}{L}\left[(x-e)\,K_L + K_{m0}\right] \quad \ldots\ldots\ldots\ldots\ldots (7)$$

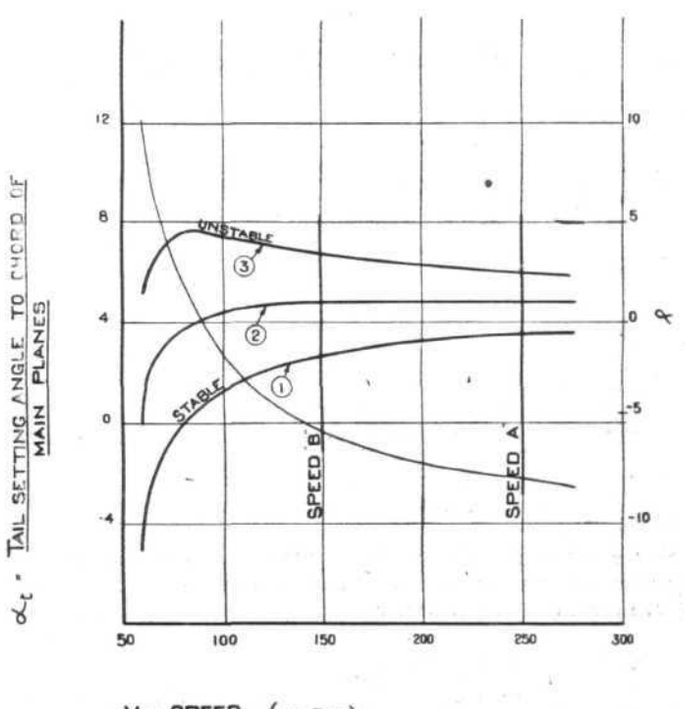
If α_t is the setting of the tail plane with respect to the chord of the equivalent plane and β is the downwash angle at the tail, and α is the incidence of the main planes, measured from no lift, then

$$K_y = a_t\,(\alpha + \alpha_t - \beta) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

where "a_t" is the slope of the tail lift curve.

TAIL SETTING ANGLES TO TRIM.

FIG. 2.



Substituting (8) in (7) and re-arranging gives

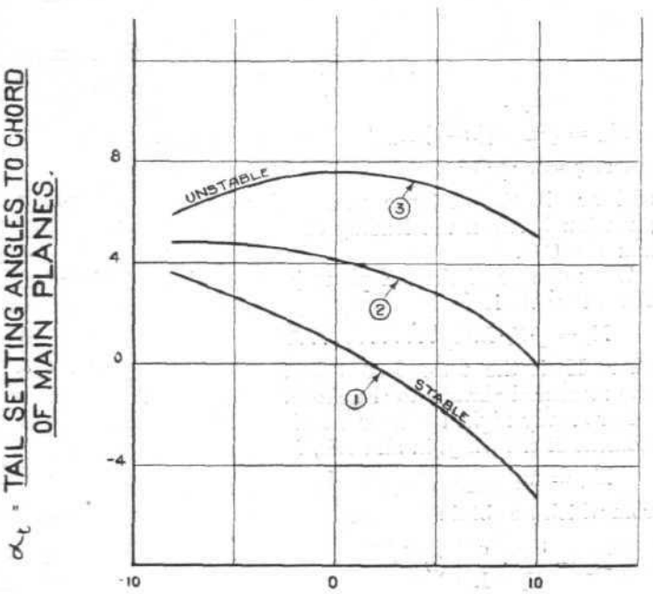
$$\alpha_t = \frac{S_W}{S_t} \cdot \frac{c}{L} \cdot \frac{1}{a_t}\left[(x-e)\,K_L + K_{m0}\right] + \beta - \alpha$$

letting $K_L = a_W\alpha$ and $\beta = b\alpha$

$$\alpha_t = \frac{S_W}{S_t} \cdot \frac{c}{L} \cdot \frac{1}{a_t}\left[(x-e)\,a_W\alpha + K_{m0}\right] + \alpha\,(b-1) \quad (9)$$

FIG. 3

TAIL SETTING ANGLES TO TRIM



For neutral stability the slope of the α_t curve against incidence is zero, as shown by Fig. 3, which shows the curves of Fig. 2 plotted against incidence instead of against V.

It follows, therefore, that

$$\frac{d\alpha_t}{d\alpha} = 0 = \frac{S_W}{S_t} \cdot \frac{c}{L} \cdot \frac{a_W}{a_t}\,(x-e) + (b-1)$$

or

$$\frac{S_t}{S_W} \cdot \frac{L}{c} = \frac{a_W\,(x-e)}{a_t\,(1-b)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (10)$$

The slope of the lift coefficient curve a_w and a_t are obtained by means of a correction to the slope of the model lift curve for some known aspect ratio, the correction being dependent upon aspect ratio only for a monoplane.

The aspect ratio is taken as being span² ÷ area, and the correction is based upon Prof. Prandtl's approximate formula for obtaining the slope of the lift curve for two-dimensional motion (infinite wing) from the slope of the lift curve for a finite wing of known aspect ratio (see translation in N.A.C.A. 116).

Re-writing the formula with notation in conformity with the remainder of the article and with the slope of the lift curve given per degree instead of per radian gives :—

$$\frac{A_W}{a_W} = \frac{1{\cdot}04\,A_W}{a_0} + 37{\cdot}82 \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (11)$$

A_W = aspect ratio of wing

a_0 = slope of lift curve for infinite wing

a_W = slope of lift curve for wing of aspect ratio A_W,

so that if a_6 = the slope for aspect 6, the slope of the lift curve for any other aspect ratio A_W is :—

$$a_W = \frac{1}{\frac{1}{a_6} - 6{\cdot}303 + \frac{37{\cdot}82}{A_W}} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (12)$$

(To be concluded.)

TECHNICAL LITERATURE

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

These Reports are published by His Majesty's Stationery Office, London, and may be purchased directly from H.M. Stationery Office at the following addresses : Adastral House, Kingsway, W.C. 2 ; 28, Abingdon Street, London, S.W.1 ; York Street, Manchester ; 1, St. Andrew's Crescent, Cardiff ; or 120, George Street, Edinburgh ; or through any bookseller.

THE AIRFLOW AROUND A CIRCULAR CYLINDER IN THE REGION WHERE THE BOUNDARY LAYER SEPARATES FROM THE SURFACE. By A. Fage, A.R.C.Sc. R. & M. No. 1179 (Ae. 343). (18 pages.) August, 1928. Price 9*d*. net.

The boundary layer around a circular cylinder was located from observations of total head taken near the surface with an exceedingly small tube. The diameter of the cylinder and the range of wind speed selected allowed the particular range of V_0D/ν from 105 to $3{\cdot}5 \times 10^5$, through which a marked change in the character of the flow around a cylinder occurs, to be covered in the experiments. The analysis shows that the distinctive traits of the boundary layer around the cylinder resemble those common to the layer along a plane surface ; that is, there is a critical point on the cylinder where a transition from the laminar to a turbulent state of flow in the boundary layer begins, and also the transitional region is marked by a rapid opening-out of the layer. The critical value of Reynolds number for the cylinder is of the same order of magnitude as that obtained by Van der Hegge Zijnen for a plane surface. The separation of the boundary layer from the surface occurs just beyond the critical point.

WIND-TUNNEL EXPERIMENTS WITH INFINITE CASCADES OF AEROFOILS. By R. G. Harris, D.Sc., F.R.S.E., and R. A. Fairthorne. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1206 (Ae. 367). (18 pages and 12 diagrams.) September, 1928. Price 1*s*. net.

The object of the experiments was to provide data for a theory of turbines, in the form of (*a*) forces on the blades and (*b*) deflection of the fluid by the blades.

The experiments were carried out in the 4-ft. wind tunnel from April to July, 1928, on the basis of the familiar cascade theory (*cf.* R. & M. 620*). A single row of blades in a turbine is represented by a row of parallel aerofoils placed across the tunnel at various angles to the tunnel axis.

Measurements were made of the forces on and the flow behind the central aerofoil of a cascade fitted up in the 4-ft. tunnel. Deflection, total head, pressure, and wind speed over a line in the plane of the centre section covering one gap were measured. The arrangements tested were : cascade axis at 45°, 22½°, and 0° to the plane of the normal cross-section of the tunnel (corresponding to staggers − 22°, 0·5°, and + 23° respectively), and also 10° on each side of these positions ; spacing of the aerofoils, ½, 1, and 1½ chords. These arrangements cover the cases of reaction and impulse turbine and compressor rotors and stators. Lift and drag also were measured on the central aerofoil with the cascade removed.

The results can be regarded as giving approximate values of the forces on an infinite cascade and should be useful for the object for which they were obtained, viz., turbine blade design. The general trend of the forces is in agreement with the equations of motion of an infinite cascade, but there are considerable discrepancies in detail, probably to be ascribed to the imitations of the experimental method.

The results may be of value for other purposes besides turbine-blade design and cascade theory ; for example, in designing guide blades for the bends of a wind tunnel. It will be noted that the minimum loss of energy per degree deflection occurs in the case $s/c = 1\frac{1}{2}$, $\phi = 22\frac{1}{2}°$, where the deflection produced by the 45° arc aerofoil is only 29°.

* Preliminary investigation of multiplane interference applied to propeller theory.—R. M. Wood and H. Glauert, A.C.A. 1918-19, p. 541.

ON THE EFFECT OF AIR COMPRESSION ON DRAG AND PRESSURE DISTRIBUTION IN CYLINDERS OF INFINITE ASPECT RATIO. By T. E. Stanton. R. & M. No. 1210 (Ae. 370) (5 pages and 2 diagrams.) November, 1928. Price 6*d*. net.

Before attempting the determination of the distribution of pressure round aerofoils at speeds in the neighbourhood of that of sound, it was thought advisable to undertake the relatively simple problem of a cylinder of infinite aspect ratio.

In order to eliminate the effect of viscosity, the experiments have all been carried out at the same value of vd/ν. From data furnished by the Aerodynamics Department, it appeared that the value of the drag coefficient of cylinders was nearly constant for values of vd/ν in the neighbourhood of 20,000, and the present experiments have all been made at approximately this value of the Reynolds number in the 3-in. high-speed wind channel.

The range of speed has varied from $0{\cdot}25a$ to $2{\cdot}0a$, and the determinations made have been : (1) the pressure distribution over the section of the cylinder passing through the axis of the wind channel, and (2) the drag of the whole cylinder from wall to wall of the channel measured on the aerodynamical balance described in R. & M. 1130.*

The general form of the pressure distribution curve at the low speeds is similar to that found by A. Fage (R. & M. 106).† As the speed of sound is approached, the value of the maximum pressure ($\theta = 0$) increases according to the Rayleigh law from $0{\cdot}5\rho v^2$ up to $0{\cdot}82\rho v^2$ at $u/a = 2{\cdot}04$. At $\theta = 180$ the value of the pressure coefficient k increases numerically from $-0{\cdot}51$ at $u/a = 0{\cdot}25$ to $-0{\cdot}60$ at $u/a = 0{\cdot}7$. For values of u/a greater than unity the value of k at 180 falls progressively to $-0{\cdot}08$ at $u/a = 2{\cdot}04$.

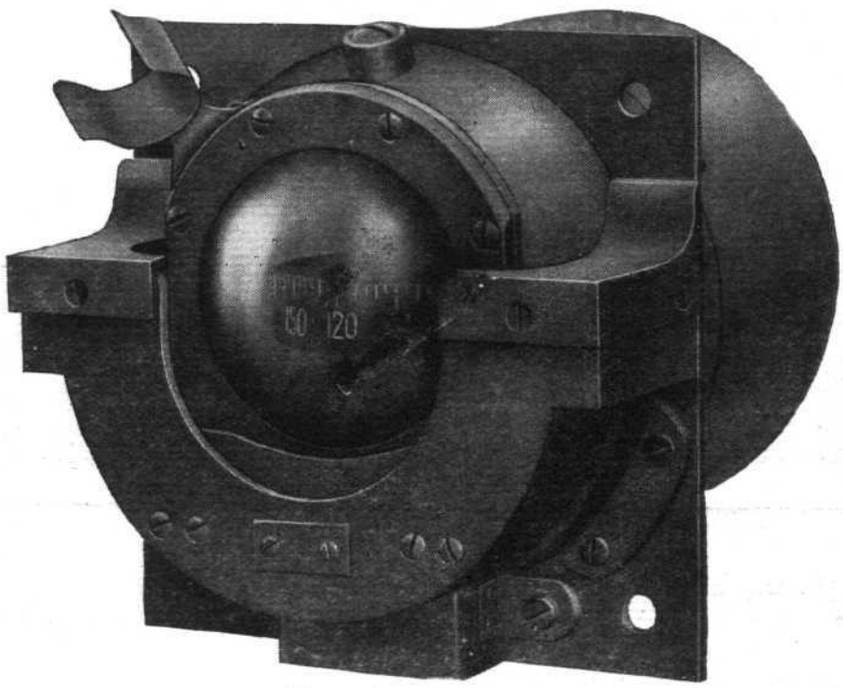
* A high-speed wind channel for tests on aerofoils.—T. E. Stanton.

† Determination of the pressure distribution round a cylinder.—A. Fage.

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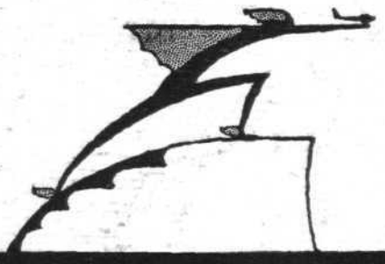
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MANCHESTER HOLDS AN AIR PAGEANT

IF you organise any outdoor function or pageant in the district of Manchester you must expect, as a natural condition, continuous rain. There was no hope from the weather for the Air Pageant last Saturday from the crack of dawn. The Wythenshawe aerodrome, which is Manchester's temporary aerodrome, where the Pageant was held, has quite a rural setting. Several machines were housed in a big barn and a farm is on the boundary. Northern Air Lines, Ltd., organised a large and varied programme, and had anticipated a large crowd, but only 8,000 lined the field when events started, having decided that it was better to see an air display in the rain than not at all. Sir Sefton Brancker, Director of Civil Aviation, flew up from London in a Cirrus-Moth, having started from Hendon.

His machine appeared over the aerodrome about 1 p.m. accompanied by another machine. He had experienced a difficult journey in bad weather lasting over three hours. The weather was fair when he left London, but 60 miles from Woodford blinding rain and wind impeded progress. A landing had to be made at Woodford for petrol. Sir Sefton Brancker remarked that he liked the Wythenshawe aerodrome and thought it was a pity it was not to be permanent. He also remarked that the Pageant was extremely well organised and marked a great step forward in aviation in the north. Another machine arrived shortly after Sir Sefton Brancker's, having flown non-stop from Glasgow piloted by Mr. D. K. Fairweather. He was wrapped in cloud practically the whole way down to Shap, and found it extremely misty over Carlisle. Mr. D. K. Fairweather owns a Cirrus-Avian, G-EBTY.

Ten machines were on the field at the beginning of the programme; then they were joined by seven machines from Woodford, which came over in formation, all making perfect landings despite the high wind, which increased in strength during the afternoon.

Events

Capt. H. A. Brown, chief test pilot to A. V. Roe and Co., Ltd., gave a good display of aerobatics on an all-metal Avro "Avian." Capt. Brown has been flying now for 14 years, and for four years he was an instructor to the Spanish Air Force. The next event was the usual fly-past of visitors.

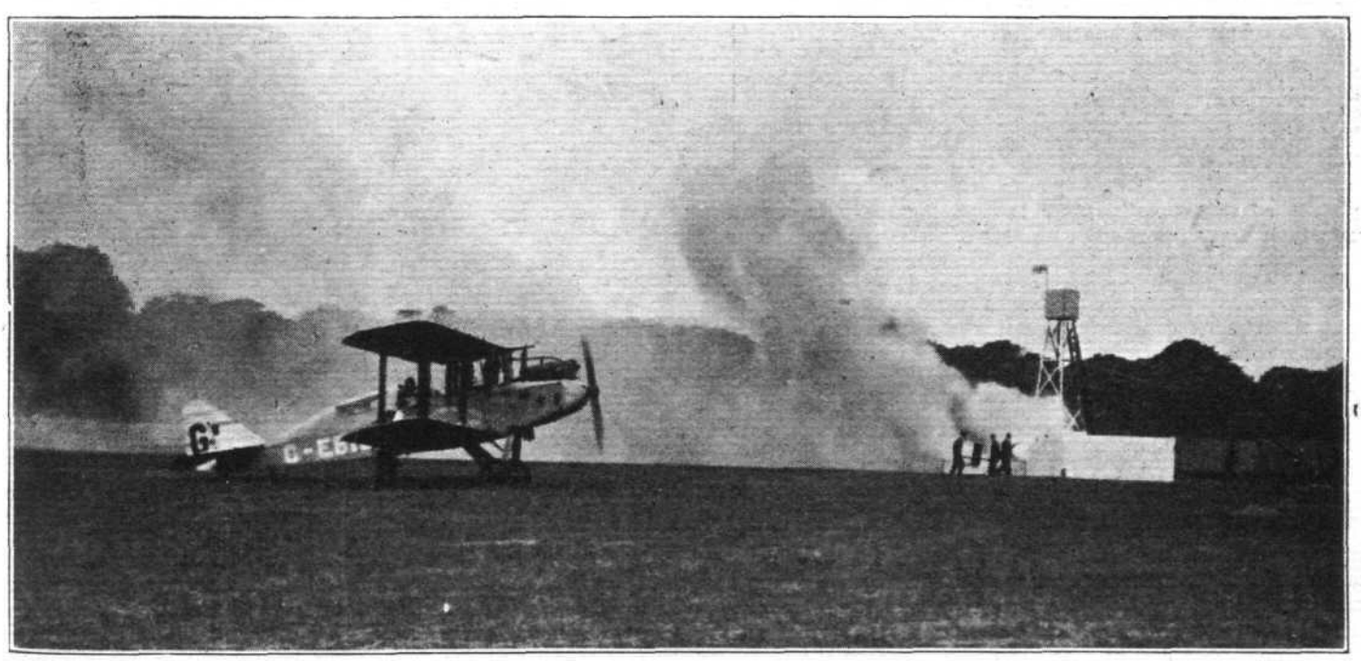
A demonstration of the new all-metal Blackburn "Bluebird" was given, and Miss Winifred Brown gave a flying exhibition on her own Avro "Avian," which she has owned for a long time. Miss Brown is a hockey player of equal repute, and was a member of the British team sent to Australia.

An air fight was staged between Mr. E. Heaton and Mr. W. Ledlie, pilots of Northern Air Lines, Ltd., on two Avros.

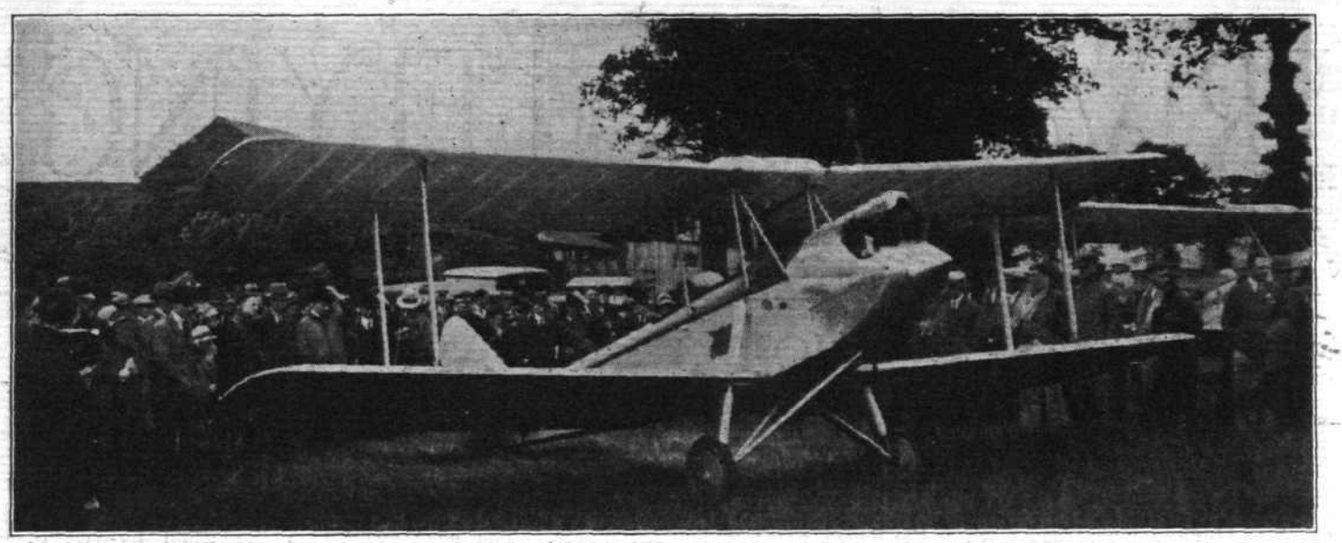
Capt. Lawson, chief pilot to Berkshire Aviation Tours, Ltd., gave a display of stunting on one of that company's machines. He has been flying since 1915 and has flown 20,000 passengers without accident. Flight-Lieut. Webster, A.F.C., the Schneider Trophy winner of 1927, contributed to the afternoon's programme with a display of crazy flying.

One set-piece of the day was entitled "The Rescue." A passenger machine flew to a village situated in troubled country where the natives were threatening the white population. It was escorted by fighting aircraft. It landed, and the white people dashed towards it, whilst the natives opened fire to show their irritation. But the machine took off safely as the fighting aircraft attacked the natives with machine guns and eventually tried a little persuasion with bombs. Then the village caught fire, which was not surprising, and so the poor natives got none.

Inverted flying was demonstrated by Capt. A. N. Kingwill, who is chief pilot to Northern Air Lines, Ltd., on an Avro "Avian" fitted with the Armstrong Siddeley "Genet." Capt. Kingwill's flying experience also covers 14 years.



This "oil well" burned well in the "desert" of Wythenshawe, but the fire-fighters, who flew up from civilisation in the D.H.9c soon stopped the rot. This was only one of the spectacular shows staged on Saturday.



This is a section of the Manchester crowd at the Pageant last Saturday watching the Avro "Avian" (their own production) take-off.

For 4½ years he tested for W. Beardmore and Co., Ltd. He has carried about 50,000 passengers.

An illustration of the utility of air transport for newspapers was another good item. The *Manchester Evening Chronicle* and *Manchester Evening News* rushed copies of their editions by car to aircraft waiting in a field close to their works, and the machines flew them quickly to Wythenshawe, where they were on sale in record time.

Another apt example of the usefulness of aircraft was shown. An oil well, which you were asked to imagine as located hundreds of miles from civilisation, caught fire. Fire-fighters were rushed to it in a D.H.9 c, and successfully stopped its antics.

Pleasure flights continued throughout the day, and in the evening further exhibitions of stunting were organised, as well as a firework display by James Pain, Ltd. One machine was illuminated with small lights fixed along the wings.

Amongst the visitors were Mr. Montague, the new Under-Secretary for Air, the Lord Mayor of Manchester, Col. G. Westcott, the Mayor of Salford, Councillor A. H. Collins, and Alderman W. Davey, chairman of Manchester's Aerodrome Commiitee.



In spite of the weather, Sir Sefton Brancker (second from left) flew up from London to Wythenshawe for the Pageant. He had difficulty in getting through the last sixty miles owing to rain and wind, but conditions must be exceptionally adverse to deter the Director of Civil Aviation from flying. On the left of him in this group of officials is Mr. John Leeming, whose company, Northern Air Lines (M/c), Ltd., organised the Pageant.



Capt. Lawson, Chief Pilot of Berkshire Aviation Tours, Ltd., receiving the approval of his pet after giving a display of stunting for the Manchester people.

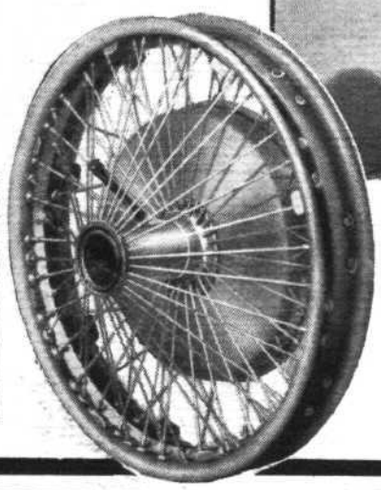
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Guild of Air Pilots

A MEETING of the "Foundation Council" of the "Guild of Air Pilots and Air Navigators" is to be held at "Rules," Maiden Lane, W.C.2, at 8.0 p.m. on July 1. The principal business will be to elect the first Master of the "Guild," when the necessary signatures will be affixed to the Memorandum and Articles of Association for registration with the Board of Trade, after which the Certificate of Incorporation issued under the Companies Act will be applied for. It is hoped that all the preliminary arrangements consequent upon the formation of the "Guild" will be completed in the very near future. A considerable number of applications for membership have been received from Commercial Air Pilots in the Dominions and the Colonies, and it is hoped soon that arrangements will be made to establish branches of the "Guild" in the principal air centres of the British Empire. It will be of interest to Commercial Pilots to learn that one of the first actions of the "Guild" was to instruct solicitors (Messrs. Wingfield, Halse and Trustam) to act on behalf of Captain Brailli at the inquest on the victims of the recent unfortunate Channel air disaster, and at any subsequent inquiries.

Safe GROUND WORK on —





See the R·A·F DISPLAY ⁝⁝ Hendon 13th July

DUNLOP

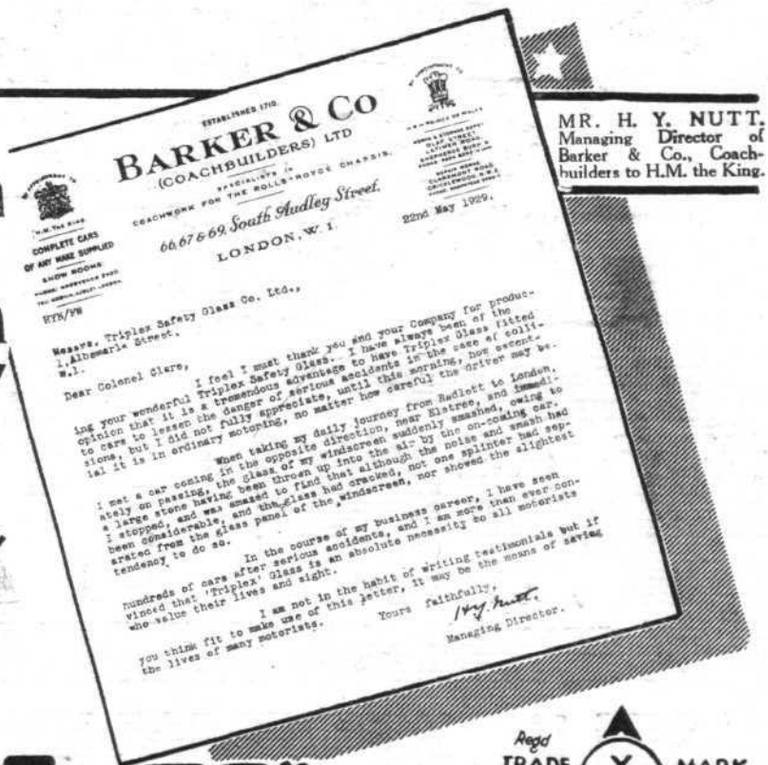
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Messrs. Triplex Safety Glass Co. Ltd., 1, Albemarle Street, W.1.

Dear Colonel Clare,

I feel I must thank you and your Company for producing your wonderful Triplex Safety Glass. I have always been of the opinion that it is a tremendous advantage to have Triplex Glass fitted to cars to lessen the danger of serious accidents in the case of collisions, but I did not fully appreciate, until this morning, how exceptional it is in ordinary motoring, no matter how careful the driver may be.

When taking my daily journey from Radlett to London, I met a car coming in the opposite direction, suddenly smashed, owing to a large stone having been thrown up into the air by the on-coming car, I stopped, and was amazed to find that although the nose and smash had been considerable, and the glass had cracked, not one splinter had separated from the glass panel of the windscreen, nor showed the slightest tendency to do so.

In the course of my business career, I have seen hundreds of cars after serious accidents, and I am more than ever convinced that 'Triplex' Glass is an absolute necessity to all motorists who value their lives and sight.

I am not in the habit of writing testimonials but if you think fit to make use of this letter, it may be the means of saved the lives of many motorists.

Yours faithfully,

Managing Director.

MR. H. Y. NUTT, Managing Director of Barker & Co., Coachbuilders to H.M. the King.

Fit "TriplеX" Regd. -and be safe!

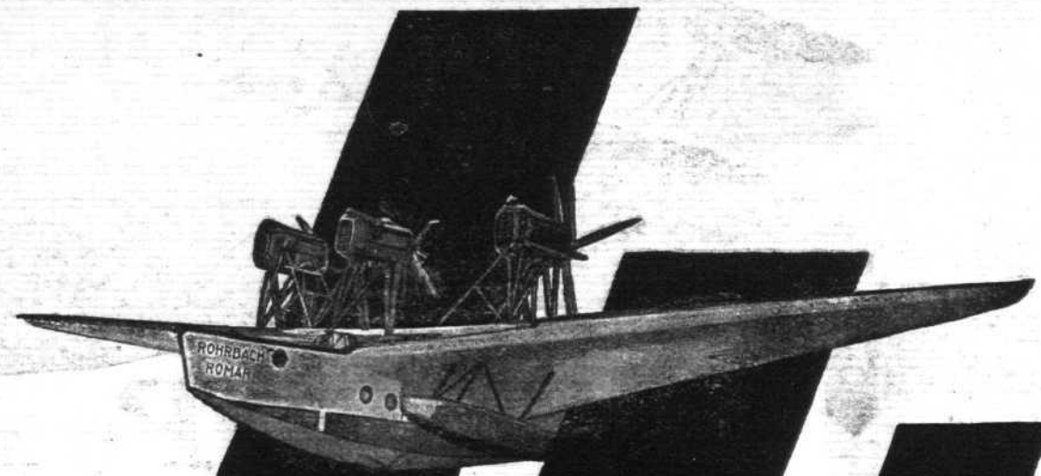
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LIGHT 'PLANE CLUBS

London Aeroplane Club, Stag Lane, Edgware, Sec., H. E. Perrin, 3, Clifford Street, London, W.1.
Bristol and Wessex Aeroplane Club, Filton, Gloucester. Secretary, Major G. S. Cooper, The Aerodrome, Patchway, Glos.
Cinque Ports Flying Club, Lympne, Hythe. Hon. Secretary, R. Dallas Brett, 114, High Street, Hythe, Kent.
Hampshire Aero Club, Hamble, Southampton. Secretary, H. J. Harrington, Hamble, Southampton.
Lancashire Aero Club, Woodford, Lancs. Secretary, Mr. Atherton, Avro Aerodrome, Woodford.
Liverpool and District Aero Club, Hooton, Cheshire. Hon. Secretary, Capt. Ellis, Hooton Aerodrome.
Midland Aero Club, Castle Bromwich, Birmingham. Secretary, Maj. Gilbert Dennison, 22, Villa Road, Handsworth, Birmingham.
Newcastle-on-Tyne Aero Club, Cramlington, Northumberland. Secretary, John Bell, Cramlington Aerodrome, Northumberland.
Norfolk and Norwich Aero Club, Mousehold, Norwich. Secretary, G. McEwen, The Aerodrome, Mousehold, Norwich.
Nottingham Aero Club, Hucknall, Nottingham. Hon. Secretary, Cecil R. Sands, A.C.A., 30, Park Row, Nottingham.
The Scottish Flying Club, 101, St. Vincent Street, Glasgow. Secretary, George Baldwin, Moorpark Aerodrome, Renfrew.
Southern Aero Club, Shoreham, Sussex. Secretary, Miss N. B. Birkett, Shoreham Aerodrome, Sussex.
Suffolk Aeroplane Club, Ipswich. Secretary, Maj. P. L. Holmes, The Aerodrome, Hadleigh, Suffolk.
Yorkshire Aeroplane Club, Sherburn-in-Elmet, Yorks. Secretary, Lieut.-Col. Walker, The Aerodrome, Sherburn-in-Elmet.

LONDON AEROPLANE CLUB

(JUNE 16–22).—Instructors: Maj. H. G. Travers and Capt. F. R. Matthews. Ground engineers: C. Humphreys and A. E. Mitchell. Aircraft:—The following machines were in commission: G-AABN, G-EBZC, and G-AAEX. Total flying time for the week, 97 hrs. 40 mins. Dual instruction: 49 members received dual instruction, the time being 56 hrs. 45 mins. Solo flying: 36 members flew solo, the time being 40 hrs. 55 mins.

L. F. Horne and M. H. Purser have passed the necessary qualifying tests for their "A" licences.

First solo flights.—First solo flights were made by C. N. Horne, A. C. L. Rendell, and F. J. Price.

BRISTOL & WESSEX AEROPLANE CLUB, LTD.

(JUNE 16-22).—Pilot instructor, E. B. W. Bartlett. Ground engineer: A. W. Webb. Machines in commission (2), TV, YH. Flying time for the week, 31 hrs. 35 mins. Pupils instructed (12), 12 hrs. 40 mins. Soloists (2), 2 hrs. 5 mins. Licensed pilots (12), 15 hrs. 20 mins. Passengers carried (13), 4 hrs. 40 mins.

Flying has only been possible on four days, or we should have stood an excellent chance of previous best for a week, this only having been made possible by the energy of our instructor, who has literally lived in the air this week. In addition to the Club flying times our private owners have been busy. Mr. Tiarks took Mr. Somerset to Eton and back, and also made trips to Radstock and Lansdown, Minchinhampton, Wickwar-Yate. Mr. Downes-Shaw went to Chichester, and Mr. Bathurst to Haldon and back. Mr. R. A. Hall had the doubtful pleasure of his second forced landing in quite a short time, when returning from Hamble in mid-week, and from a very unusual cause. His engine suddenly gave out entirely, in not too healthy country near Warminster. He landed safely in wheat, and was lucky to find a farmhouse close by which supplied both a telephone and a meal. Mr. Bathurst at once flew our ground engineer to the spot, and it was found that the thread of the variable jet had stripped. Webb was equal to the occasion, and Mr. Hall flew the machine back here. Except that the machine looked as if it had been to a harvest festival it was none the worse.

Capt. H. S. Broad has very kindly promised to come and give us an aerobatic display on June 30, as the weather spoiled his last attempt.

CINQUE PORTS FLYING CLUB, LTD.

(JUNE 16-22).—Pilot instructor: Flying Officer K. K. Brown. Ground engineer: R. H. Wynne. Machine in commission: de H. Moth R.I. Total for week, 25 hrs. 30 mins. Dual instruction: Mr. Fisher, 1 hr. 15 mins.; Mr. Hughes, 4 hrs. 30 mins.; Mr. Cox, 30 mins.; Mr. Mann, 1 hr.; Lieut.-Comdr. Gubbins, R.N., 2 hrs. 45 mins.; Mr. Iles, 1 hr. 30 mins.; Mr. Lillingston, 1 hr. 15 mins. Total, 7 members: 12 hrs. 45 mins. Advanced dual: Mr. Ellis, 1 hr. 30 mins.; Mr. Richardson, 15 mins. Total, 2 members: 1 hr. 45 mins. Soloist under instruction: Mr. Fisher, 2 hrs. "A" Pilots: Mr. Ellis, 1 hr. 45 mins.; Mr. Richardson, 5 hrs.; Mr. Edgson Wright, 45 mins. Total, 3 members: 7 hrs. 30 mins. Joy-ride (1), 10 mins. Tests (6), 1 hr. 5 mins.

An improvement in the weather allowed club flying every day this week, with the result that the total shot up to 25 hrs. 30 mins., which is good work for only one machine.

On Sunday, the 10th, Mr. H. I. Fisher, of Trinity Crescent, Dover, made a perfect landing at a height of about 15 ft. Unfortunately, he preferred to sit back and wait for the bump rather than put on his engine and do another circuit; the result was a broken starboard bottom longeron and two starboard wings on P.M., and this machine has been taken to Brooklands for repair. Next day, Mr. Fisher passed all his tests for "A" licence on R.I. in good style.

On Thursday, the 20th, Mr. Iles, of Broadstairs, commenced tuition.

The Club will be closed from 12.30 p.m. on Thursday morning until 10.30 a.m. on Saturday morning, while R.I. attends the Rotterdam Flying Meeting.

HAMPSHIRE AEROPLANE CLUB

(JUNE 15-21).—Pilot instructors: Flight-Lieut. F. A. Swoffer, M.B.E., and Mr. W. H. Dudley. Ground engineers: Messrs. E. Lenny, S. Riches and J. Elliott. Aircraft: D.H. 60 "Moth" G-EBOH and "Spartan" G-AAFR. Flying time for the week: 43 hrs. 45 mins. Pupils under instruction: (22), 19 hrs. 30 mins. Soloists: (7), 12 hrs. 40 mins. "A" pilots: (13), 6 hrs. 35 mins. Passengers: (8), 4 hrs. 10 mins. Instructors, solo and tests: (10), 50 mins.

Lieut. Villiers, R.N., Messrs. Pratley, James, Parkerson, Hayne, Manning, Staniland, Mrs. March, Mrs. Tobutt and Miss Leathart joined the club this week. Mr. Couchman and Miss Pike successfully passed the tests for their "A" licences and Mr. Lowe Wylde passed his height test.

Members are reminded that they may obtain two 10s. tickets for the price of one for the Royal Air Force Display at Hendon, on application to the secretary. All applications must be made before June 30, and each must be accompanied by a remittance for 10s.

We were particularly pleased to see our member, Mr. P. A. Wills, on Thursday, who has now completely recovered from his accident of last winter. He flew to Hamble, with a friend, on G-EBOI, which was one of the two "Moths" with which this club commenced operations in 1927. OI was sold to Mr. Wills a few weeks ago. Its companion, OH, is still going strong and has now been flown for over 1,100 hrs.

LANCASHIRE AERO CLUB

(JUNE 16–22).—Flying time: 18 hrs. 15 mins. Instruction: (14), 5 hrs. 45 mins. Solo: (15), 8 hrs. 55 mins. Passenger: (10), 2 hrs. 5 mins. Tests: (9), 1 hr. 30 mins.

Instruction: (with Mr. Hall), Foote, Stross, Lister, Howarth, Ashworth, J. H. Russell, Greg, Boon, Hindley, Faulkner, Riley, Nelson, J. G., Taylor, S. With Mr. Cantrill: Ashworth, F. S. Machines in commission: XD, QL.

Soloists (under instruction): Greg, Lister, Russell, Foote, Ashworth, W.

Pilots: Lacayo, Goodfellow, Twemlow, Maxwell, Mills, Nelson, D., Hall, R. F., Ruddy, Hall, Whitehouse.

Passengers, with Mr. Cantrill: Strain, Miss Knight, Miss Grey. With Mr. Gattrill: Fowler. With Mr. Ruddy: Brimelow. With Mr. Harrison: Harrison, T. S. With Mr. Michelson: Browning. With Mr. Meads: Brown. With Mr. Hall, R. F.: Foote. With Mr. Hall: Weale.

The club closed down on Saturday afternoon in order that its machines might go over to support the Northern Air Lines Flying Pageant, at Wythenshawe Aerodrome.

This fact, coupled with high wind has reduced the flying hours but, nevertheless, two members have completed most of the tests for their "A" licences and Mr. Russell has accomplished a successful first solo.

Messrs. Howarth and Boon have commenced flying instruction during the week.

LIVERPOOL & DISTRICT AERO CLUB

(JUNE 16–22).—Machines in commission: Avro "Avians," WK, XY, ZM. Instructor: Flight-Lieut. J. B. Allen. Ground Engineers: Messrs. H. Pixton, M. Mason. Hours flown: total, 34 hrs. 30 mins.; dual (25), 19 hrs. 55 mins.; solo, pupils (3), 30 mins.; "A" pilots (11), 9 hrs. 45 mins.; passengers (7), 3 hrs. 45 mins.; tests (7), 35 mins.

New pupils taking instruction: Messrs. F. L. Dean and I. D. Auchterlonie. Messrs. W. G. Ellis and J. P. McGeagh were both launched solo this week, and returned to *terra firma* without adding a single grey hair to Allen's devoted head.

Mr. Davison flew to Newton on Friday in order to pay a business call.

Mr. Davison, with Mr. Wilson as passenger, flew over to Wythenshawe on Saturday evening to have a look at Northern Air Line's Flying Display. Their return was delayed by a strong headwind. Davison swears that whilst flying along the Manchester Ship Canal he observed a steamer actually overtaking them. One may expect anything from a man who ties a stuffed Kiwi to his bracing wires as a mascot!

MIDLAND AERO CLUB

(JUNE 16–22.)—The total flying time was 43 hrs. 22 mins.. Dual: 18 hrs. 50 mins. Solo: 13 hrs. 35 mins. Passenger: 10 hrs. 10 mins. Test: 47 mins.

The following members were given dual instruction by Mr. W. H. Sutcliffe:—A. P. Hunt, H. A. Taylor, J. E. Yardley, A. F Hill, H G. Tower, J. R. Bond, K. S. Neale, T. N. Khatrie, G. Norton, Dr. W. G. Tilleke, J. H. Stevens, L. W. Farrer, F. G. Robinson, F. T. Lydall, G. T. Davis, B. P.-A. Vallance, H. Beamish, M. Turner, N. B. Tompson. Advanced dual: F. J. Steward.

"A" Pilots:—J. K. Morton, S. Duckett, J. Cobbe, S. H. Smith, J. Rowley, G. W. Fellowes, R. L. Jackson, E. D. Wynn, W. N. Morris, W. L. Handley.

Soloists:—T. G. Ellison, K. S. Neale, T. N. Khatrie, Dr. W. G. Tilleke, J. C. Chaytor, P. B. Hackett, J. H. Stevens, H. E. Evans, A. P. Hunt. Twenty members were given passenger flights.

Mr. A. P. Hunt was given a refresher course, preparatory to flying the new Civilian Coupé light aeroplane at Burton, in about three weeks' time. This should prove an exceedingly interesting machine, as it incorporates several new ideas, and we shall be pleased to see Mr. Hunt drop in with it very shortly.

NEWCASTLE-UPON-TYNE AERO CLUB

(JUNE 17–23.)—Instructor: G. M. S. Kemp. Engineer: W. Dunning, Assistant: J. Tait. Aircraft: 3 PT, QV, LX. Flying time: 25 hrs. 30 mins. Instruction: 14 hrs. 35 mins. "A" Pilots: 5 hrs. 25 mins. Solo training: 3 hrs. 55 mins. Passengers: 55 mins. Tests: 40 mins.

Flying at the aerodrome suffered a severe set back, there being no flying for two or three days. High winds were very prevalent in the north. Mr. F. Addison completed, on Sunday, his first solo flight, very successfully. Messrs. Wilkens and Sutherland completed their tests for the "A" Licence.

Sir Sefton Brancker arrived, on Sunday, on a visit in his Moth, G-EDCA shortly after lunch he left for Edinburgh.

SUFFOLK & EASTERN COUNTIES AEROPLANE CLUB

(JUNE 16–22.)—Instructors: G. E. Lowdell, A.F.M., and R. T. M. Clayton. Ground engineers: E. Mayhew and H. C. Brown. Aircraft: "Bluebirds" RE, SZ, UH, and ABF. Aerodromes: Hadleigh, Suffolk and Conington, Cambs.

Total flying time: 50 hrs. 5 mins., by Suffolk and Cambridge Clubs, as follows:—

Suffolk Aero Club.—Total flying time: 29 hrs. 50 mins. Eleven members were given dual (13 hrs. 30 mins.); 3 members flew solo, under instruction (1 hr. 45 mins.). Flights were made by eight "A and B" Licence members (10 hrs. 50 mins.). Seven passengers were carried (2 hrs. 25 mins.). Fourteen tests were made (1 hr. 20 mins.).

Creditable first solos were made by Messrs. B. F. Marriage and King Salter. Quite a number of visitors came to Hadleigh during the week. On Sunday, the weather in East Anglia was not very suitable for instruction, so that we had the pleasure of a visit from the Norwich Club with two



CIRRUS SERVICE: Only the cynic will say that here is Capt. N. Stack carrying a spare engine in his D.H.9 in case of trouble with the other one. Actually this photograph gives an example of Cirrus Service. A Cirrus Mk. III engine, which everyone will recognise, was urgently needed by the Blackburn Aeroplane Co., Brough, E. Yorks, so the two back seats were removed from the D.H.9 by the A.D.C. Aircraft, Ltd., to convey the engine by air, much to the mutual satisfaction of the two aviation companies.

"Moths" and two "Avians." On Monday, we were honoured by a visit from our President, the Hon. Lady Bailey, and on Tuesday, Miss Spooner gave us a look up, while Mr. G. Murray looked in several times on his "Moth."

Cambridge Aero Club.—Total flying time: 20 hrs. 15 mins. Ten members were given dual (6 hrs. 45 mins). One member flew solo under instruction (1 hr.). Flights were made by one "A" Licence member (1 hr. 5 mins.). Five passengers were carried (10 hrs. 35 mins.). Eight tests were made (50 mins.).

Three new members started instruction during the week. King and Harper, Ltd., Automobile Engineers, of Cambridge, are starting a light aeroplane engine repair depot, and arrangements are being made for them to carry out engine overhauls for the Suffolk and Eastern Counties Aeroplane Club. These facilities will, no doubt, be of value to private owners also.

YORKSHIRE AEROPLANE CLUB

(JUNE 16-22.)—Pilot instructor: Flight-Lieut. H. V. Worrall, D.S.C. Ground engineer: R. Morris. Assistant ground engineer: G. Speight. Machines in commission:—Three (SV, RF and BD). Flying time for the week: 25 hrs. 5 mins. Instruction: (6), 2 hrs. 30 mins. Soloists: (4), 2 hrs. 50 mins. "A" pilots: (15), 18 hrs. 15 mins. Passengers: (6), 1 hr. Tests: (3), 30 mins.

Our small number of flying hours is due to the high winds which have prevailed throughout the week. In spite of this, however, Mr. Hylton was launched on his first solo, and Mr. J. Birch successfully completed his tests for his "A" Licence.

FROM THE FLYING SCHOOLS

Brooklands School of Flying, Brooklands Aerodrome

(JUNE 10-16).—Total flying time, 27 hrs. 25 mins.

The prevalent gales of the latter part of the week have considerably lowered our flying time but our workshops have been correspondingly busy with overhauls for private owners. The school has sold Moth G-EBPR and purchased an X type Moth G-EBZE to replace it. The latter machine was delivered here on Thursday mid-day and on Friday evening it was ready for test, having been completely overhauled for C. of A. and repainted. Two new pupils have joined the school—Messrs. Christian and Graham.

(JUNE 17-23).—Flying time, 56 hrs. 20 mins. A good week's flying has been done, the most interesting event being the return of Sir Philip Richardson, M.P., from his trip to Barcelona in his D.H.50 machine, piloted by Capt. E. A. Jones. A thrilling time was experienced when Jones had to fly through a gorge in the Pyrenees for some miles owing to low mists and the width of the gorge being approximately 100 to 150 ft. wide!

We congratulate Mr. A. De C. A. Squarey on his first solo, after much perseverance.

The following new pupils have joined the school:—Messrs. Shalit, Briggs and Purdie, the well-known racing car driver.

Phillips and Powis School of Flying, Reading Aerodrome

(JUNE 14-20).—Flying time, 23 hrs. 10 mins. Instructors: Flying Officer R. T. Shepherd, Mr. H. B. G. Michelmore. Major Allen has placed an order with us for a new Gipsy Moth, and is taking delivery next week. The bar is now installed on the aerodrome. We repeat our last week's invitation to private owners.

Surrey Flying Services School of Flying, Croydon Aerodrome

(JUNE 22).—Instructors: J. J. Flynn and E. F. Smith. Ground Engineers: R. Fox and F. L. Kent. Machines: BW, VK, ZB, GB, YW, DU. Flying time: 74 hrs. 55 mins. Passengers carried: 1,274.

A number of new pupils have joined the school during the week, and Mr. Storrs succeeded in passing his tests for "A" licence.

The new D.H.9 is in service, having been tested this week-end by Capt. A. F. Muir. Mr. Smith has returned to duty after his prolonged illness, and is complete with his "B" licence.

Mr. Flynn has carried out a number of special flights on VK, visiting Birmingham, Grantham, Cambridge, etc., etc.

New Private Owners

THE following Private Owners have registered their own machines on the dates given and join the growing number of owners.

Owner	Engine/Machine	Letters	Regist.
Hon. H. C. H. Bathurst	Gipsy-Moth	G-AAHF	21.5.29
H. Bharucha	Cirrus-Moth	G-EBMV	14.5.29
C. Coombes	Cirrus-Spartan	G-AAHA	6.5.29
E. Cohen	Cirrus-Avian IV	G-AAGR	23.4.29
S. B. Cave	Gipsy-Moth	G-AAGM	22.4.29
A. F. H. Gee	Cirrus-Moth	G-EBMF	15.5.29
L. Ingram	Gipsy-Moth	G-AAHO	24.5.29
H. M. Pearson	Austin "Whippet" (Anzani)	G-EAPF	23.4.29
R. C. Quilter	Gipsy-Moth	G-AADD	5.6.29
Miss E. J. Slade	Cirrus-Moth	G-EBSA	3.6.29
Mrs. E. May Scott	Cirrus-Avian IIIa	G-EBYO	7.6.29
J. L. Shand	Gipsy-Moth	G-AAHU	27.5.29
W. P. Taylor	Gipsy-Moth	G-AAIA	1.6.29
A. P. Turner	Cirrus-Avian IV	G-AAHN	22.5.29
E. M. Tiarks	Gipsy-Moth	G-AAHB	10.5.29
A. F. Wallace	Gipsy-Moth	G-AAHG	21.5.29

BFW.M.23 Light Plane

DURING the Geneva Exhibition Walter Mittelholzer, the Swiss pilot, flew the BFW.M.23 light aeroplane which is fitted with an Armstrong Siddeley "Genet," and reported very favourably upon its qualities. This machine is produced by Bayerische Flugzeugwerke A.G.

R.AE.S. AND INST.AE.E.

Inventions Section

THE Royal Aeronautical Society is devoting a portion of the accommodation allotted to it at the International Aero Exhibition at Olympia to the exhibition of Inventions relating to Aeronautics which have not as yet reached the point of commercial development. The conditions regarding entries are set out below. All those interested should communicate with the Secretary of the Royal Aeronautical Society, 7, Albemarle Street, W.1, *as quickly as possible*, and in any case not later than Saturday, June 29, after which no entries can be considered.

(1) Every device submitted should be patented or, failing this, a provisional specification should have been filed with the Patent Office.

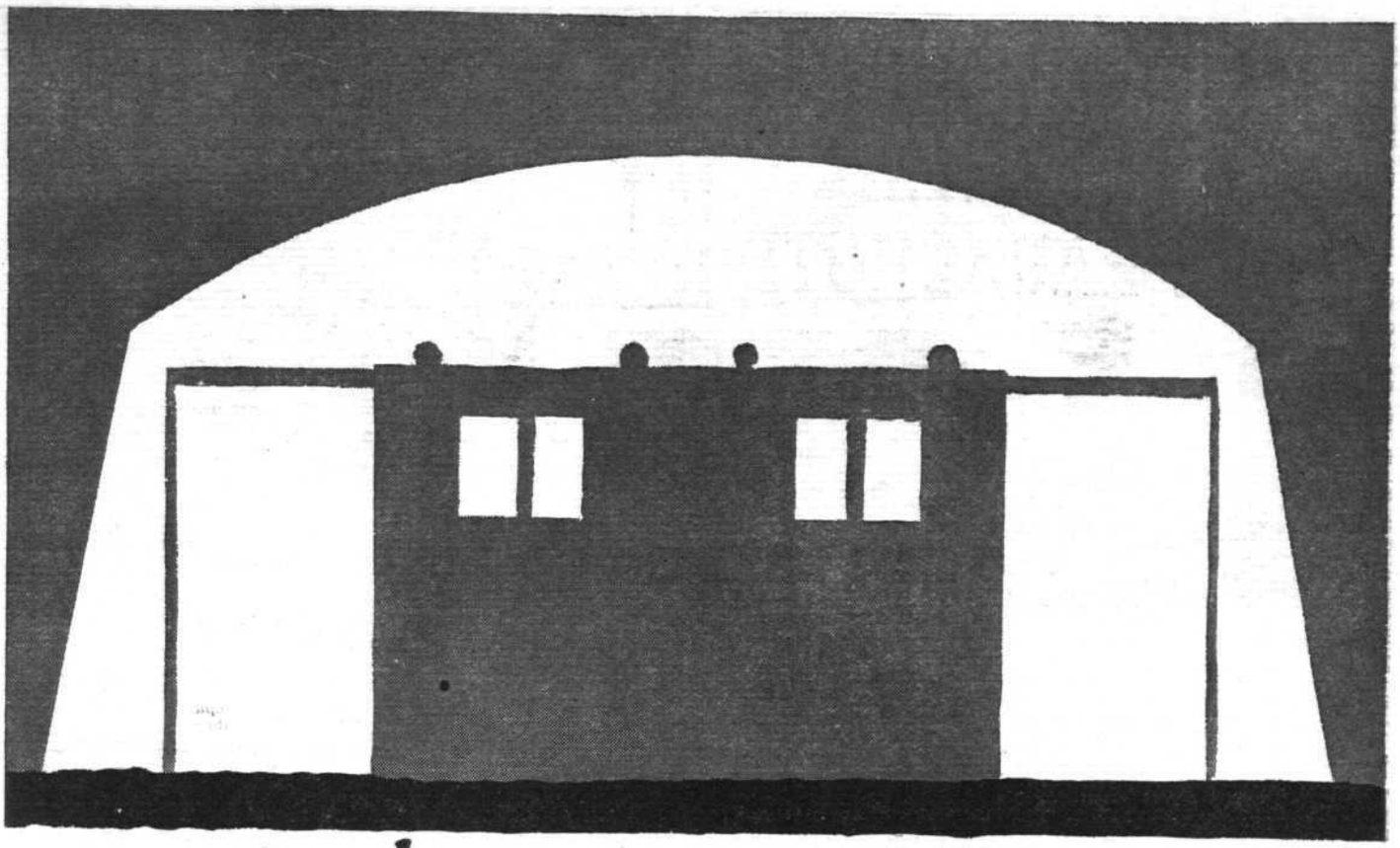
(2) Only devices which have not yet reached the stage of commercial development may be submitted.

(3) Devices should be of such a nature that they can be displayed on a counter (or floor) space not exceeding 8 ft. square.

(4) A charge of 2 guineas will be made for each device exhibited. This charge will include the necessary accommodation, and a ticket of admission to Olympia available during the period of the Exhibition.

(5) All arrangements for the installation, demonstration and removal of each device must be arranged for by the Exhibitor. Special labels will be sent for the forwarding of exhibits. Exhibits must arrive at Olympia between July 11 and 15, by which time their installation must be completed.

(6) The Council of the Royal Aeronautical Society reserves the right to refuse any which does not comply with the above conditions or which is otherwise considered unsuitable.



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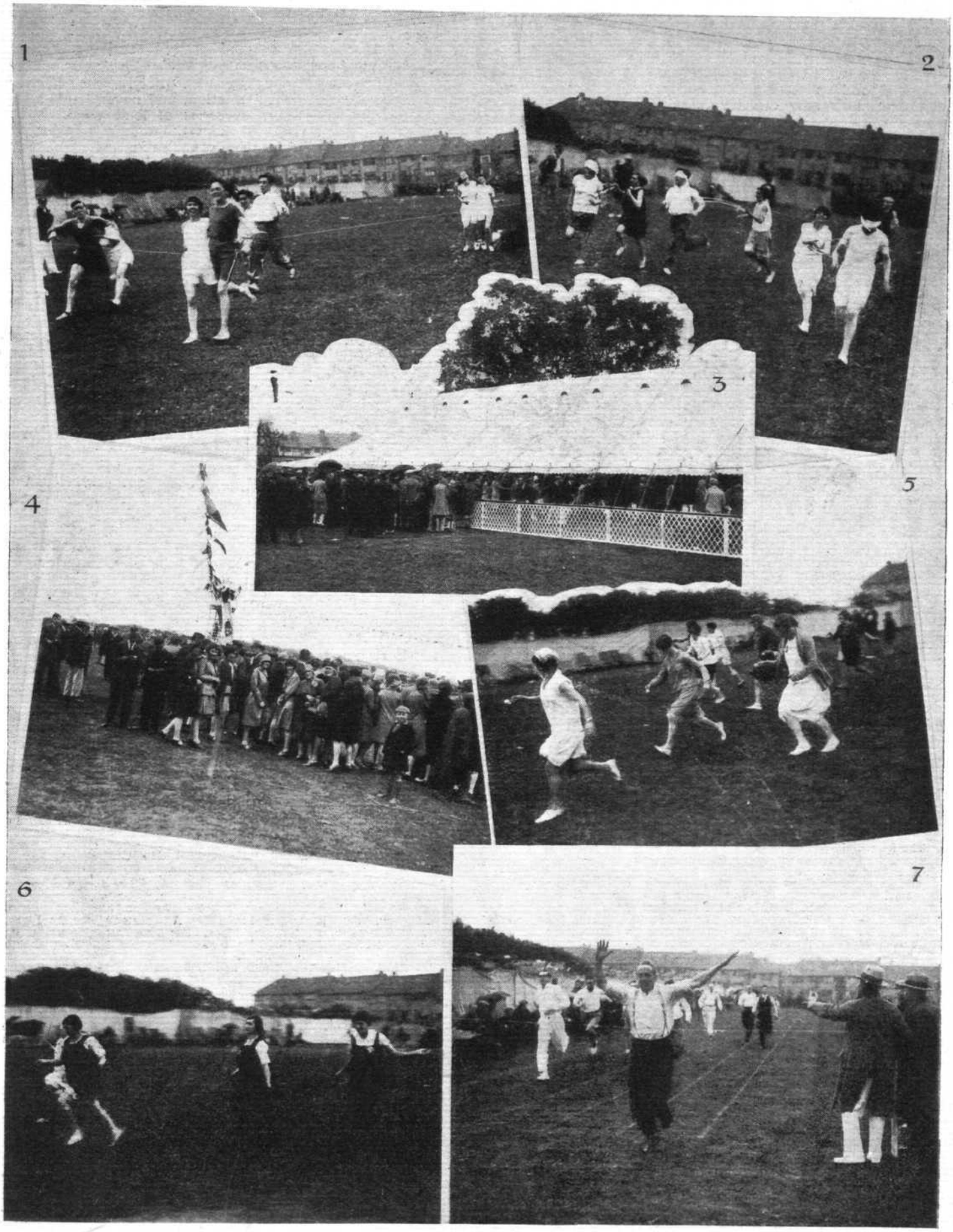
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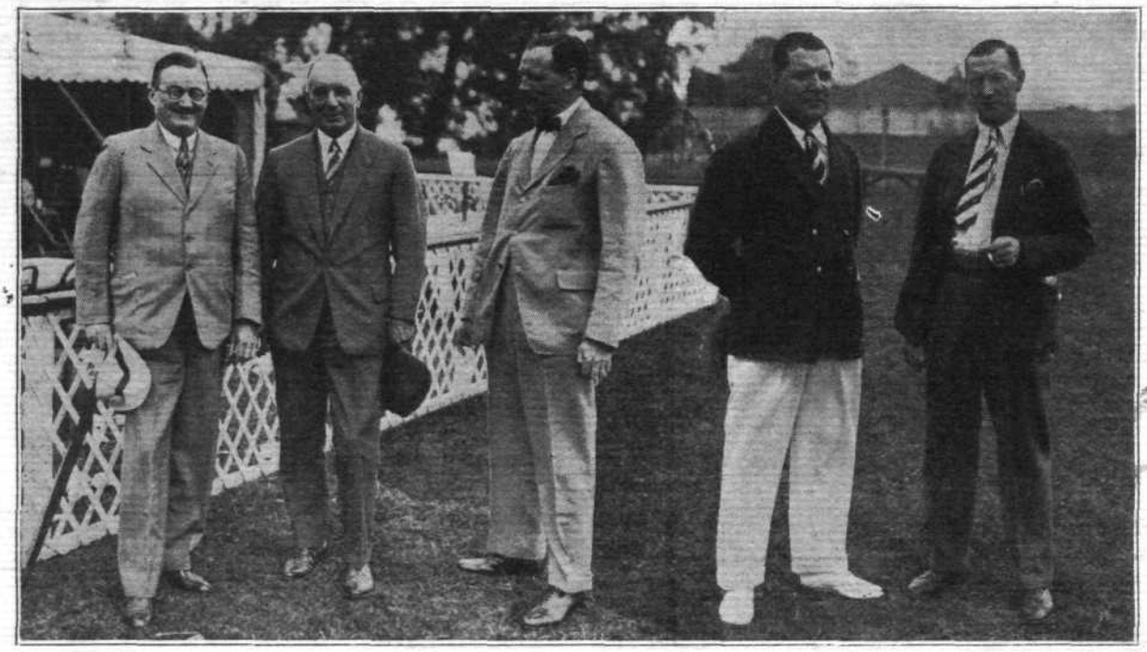


"FLIGHT" *Photographs*

S. Smith and Sons (M.A.) Ltd. Annual Sports were held last Saturday, and our "action" groups reveal the gusto of the numerous competitors :—(1) Miss Prother and Miss Weaver win the three-legged race. (2) Blindfold Race, with Miss E. Tyther and Mr. A. Clements winning in fine style. (3) Crowd waiting to enter the refreshment tent to shelter from the rain. (4) The Helter Skelter Event—which was easily the most popular side-show. (5) Egg and Spoon Race, won by Miss White, in white! (6) Skipping Race. (7) The "Heads" take the field—management and foremen showing good form and action. The winning "flying" figure is Mr. Bigland. A brief report of this Sports Meeting will be found on page 528.

S. SMITH AND SONS RELAX

THE Annual Sports of S. Smith and Son (M.A.), Ltd., Cricklewood, were held on Saturday last, at the firm's regular sports ground on the North Circular Road. As usual, the chairman, managing director and several other directors, always with the employees' interests and welfare at heart, were well in evidence, making sure everyone should thoroughly enjoy the day. The works closed down completely, the entire staff changing over from work for this special occasion. The usual Smith's luck regarding the weather forsook them this time, rain falling until 5 or 6 o'clock, but even this was unable to damp the enthusiasm of the crowd. For fun the "Helter Skelter" proved the great attraction, and never wanted for patronage the entire day. A series of loud speakers, in addition to a first-class band, kept the company in happy mood from start to finish. The organisation, as usual, was perfect, every event being run off without a hitch.



Officials of S. Smith and Sons (M.A.), Ltd., at Saturday's Sports: (Left to right), Mr. Henderson Cleland (Chairman); Mr. Gordon Smith (Managing Director); Mr. C. W. Nicholls (Director and Sales Manager); Mr. B. E. N. Havilland (Works Manager); and Mr. J. E. Chorlton (Aviation Manager.)

"FLIGHT" *Photograph*

THE ROYAL AIR FORCE

London Gazette, June 21, 1929.

General Duties Branch

The follg. Sub.-Lieuts., R.N., are granted temporary commns. as Flying Officers, on attachment for duty with R.A.F. (June 10):—A. C. R. Duvall, J. A. S. Colquhoun.

The follg. Pilot Officers are promoted to rank of Flying Officer:—M. G. Bircham, M. R. Kelly (Jan. 8); W. D. Butler, G. K. Horner, H. J. Cross (April 9); P. J. H. Halahan, J. H. L. Dillon-Trenchard (June 17).

Flight-Lieut. I. M. Rodney is placed on half-pay list, scale B, June 14, 1929, to September 13, 1929, inclusive. (Substituted for *Gazette*, May 14.) The follg. are placed on retired list at their own request:—Wing Commander T. W. Mulcahy-Morgan, M.C. (June 17); Flight-Lieut. A. G. Jarvis, A.F.C. (June 10).

The follg. are transferred to Reserve:—CLASS A.—Flight-Lieut. C. V. Lock (June 19); Flying Officer N. W. K. Seeman (June 6). CLASS C.—Flight-Lieut. S. Wallingford (June 19).

Flying Officer D. C. Shaw resigns his short service commn. (June 19); Flying Officer C. J. Stone relinquishes his permanent commn. on transfer to the Army (June 12). The follg. relinquish their short service commns. on account of ill-health:—Flying Officer J. S. Georgeson (June 8); Pilot Officer on probation R. N. Dashwood Tandy (June 19). The short service commn. of Pilot Officer on probation T. F. Balfour is terminated on cessation of duty (June 19).

Stores Branch.

Sqdn.-Ldr. P. Adams, O.B.E., is transferred to Reserve, Class C (June 17).

Medical Branch

Sqdn.-Ldr. J. H. Peek, M.D., D.P.H., relinquishes his short-service commn on account of ill-health (June 19).

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

C. G. Higgins is granted a commn. in Class A.A. (ii.) as a Pilot Officer on probation (June 4). The follg. Pilot Officers on probation are confirmed in rank:—G. R. M. Garratt (June 14); G. Williams (June 15). Flight-Lieut. R. M. Stirling, A.F.C., is transferred from Class A to Class C (June 9); Flying Officer W. F. Davenport is transferred from Class A to Class C (December 11, 1928); Flight-Lieut. W. J. Umpleby is transferred from Class C to Class A (June 9).

The follg. Flying Officers relinquish their commns. on completion of service: L. E. Owen (January 27); H. C. Adams, M.C. (June 8).

Pilot Officer on probation E. A. Clench relinquishes his commn. on account of ill-health (June 19).

Medical Branch

Flight-Lieut. J. A. Quin, M.D., B.A., is transferred from Class D2 to Class D1 (May 31, 1929), and is re-employed with Regular Air Force for a period of one year from June 4, 1929.

AUXILIARY AIR FORCE

General Duties Branch

No. 600 CITY OF LONDON (BOMBING) SQUADRON.—The follg. Pilot Officer to be Flying Officer:—L. A. Hackett (July 31, 1928).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Wing Commander E. W. Norton, D.S.C., to No. 58 Sqdn., Worthy Down, to command, 18.4.29.

Squadron Leaders: A. H. Peck, D.S.O., M.C., to Air Ministry (A.M.S.R.), 10.6.29. G. C. Pirie, M.C., D.F.C., to No. 10 Sqdn., Upper Heyford, 21.5.29. E. C. Emmett, M.C., D.F.C., to No. 99 Sqdn., Upper Heyford, 14.6.29.

Flight Lieutenants: R. R. Greenlaw, M.B.E., to Armoured Car Wing, Iraq, 7.6.29. O. E. Worsley, to No. 29 Sqdn., North Weald, 10.6.29. B. V. Reynolds, to No. 402 (Fleet Fighter) Flight, Mediterranean, 1.6.29. D. d'H. Humphreys, to No. 462 (Fleet Torpedo) Flight, 12.6.29.

Flying Officers: C. H. Johnson, to R.A.F. Depot, Uxbridge, 31.5.29. C. K. J. Coggle, to R.A.F. Depot, Uxbridge, 19.5.29. W. J. M. Spaight, to No. 6 Sqdn., Iraq, 24.5.29. D. L. Maclean, to Home Aircraft Depot, Henlow, 11.6.29. C. C. O'Grady, to R.A.F. Depot, Uxbridge, for Administrative duties, 10.6.29.

Pilot Officers: The following are all posted to R.A.F. Base, Gosport, with effect from 14.5.29:—D. B. McGill, A. D. Jaffe and W. R. Worstall.

Stores Branch

Flight Lieutenants: H. T. H. Copeland, to Home Aircraft Depot, Henlow, 1.7.29. R. F. Wilson, to No. 4 Stores Depot, Ruislip, 4.7.29.

Flying Officers: A. Connock, to No. 501 Sqdn., Filton, 11.6.29. H. D. Giblett, to H.Q., Middle East, 27.5.29. P. H. Wilcox, to No. 4 Stores Depot, Ruislip, 16.6.29. W. H. Bowden, to H.M.S. *Eagle*, Mediterranean, 10.6.29.

Accountant Branch

Flight Lieutenant W. E. Fisher M.C., to R.A.F. Depot, Uxbridge, 25.5.29.

Flying Officer J. Lambie, to H.Q., Inland Area, 23.5.29.

Medical Branch

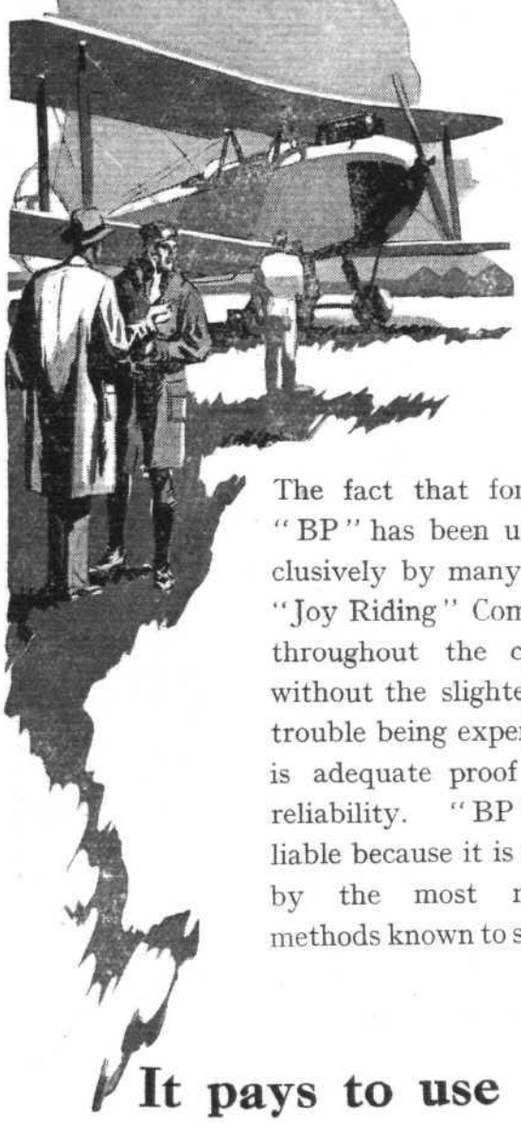
Wing Commanders: B. A. Playne, D.S.O., M.B., B.A., to Princess Mary's R.A.F. Hospital, Halton, for duty as Commanding Officer, 24.6.29. H. A. Hewat, M.B., D.T.M. & H., to Air Ministry (D.M.S.) for medical staff duties, 24.6.29.

NAVAL APPOINTMENT

The following appointment was made by the Admiralty on June 20.

Lieut. S. Borrett (F/O. R.A.F.), to *Victory*, for full flying duties in training flight at Lee-on-Solent, temp. (June 7).

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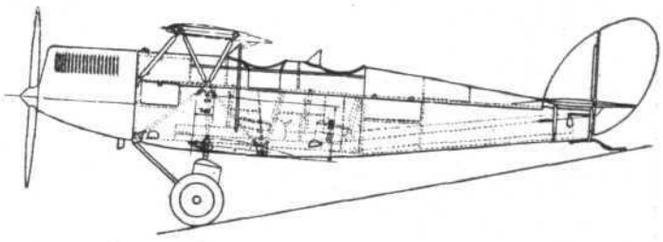
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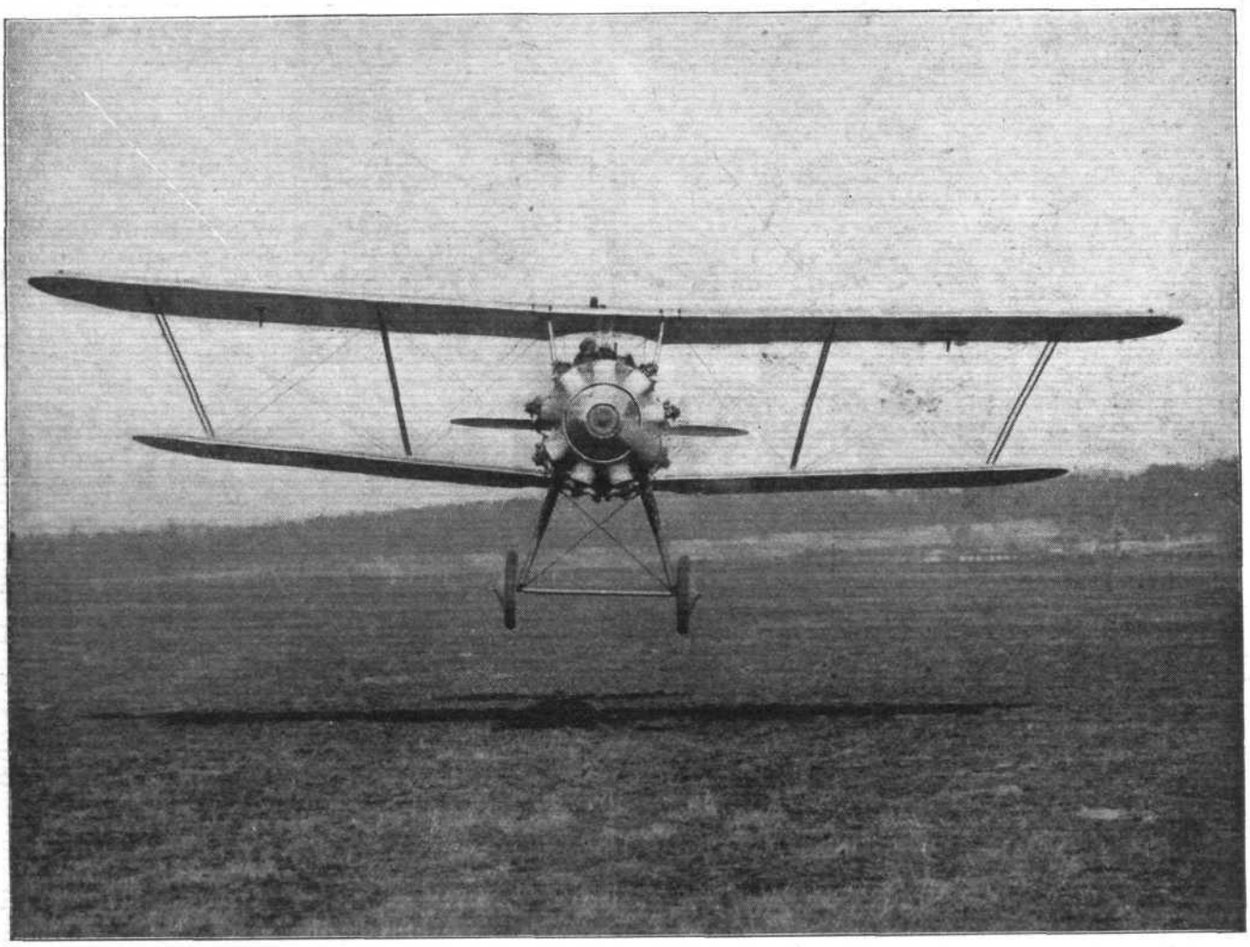
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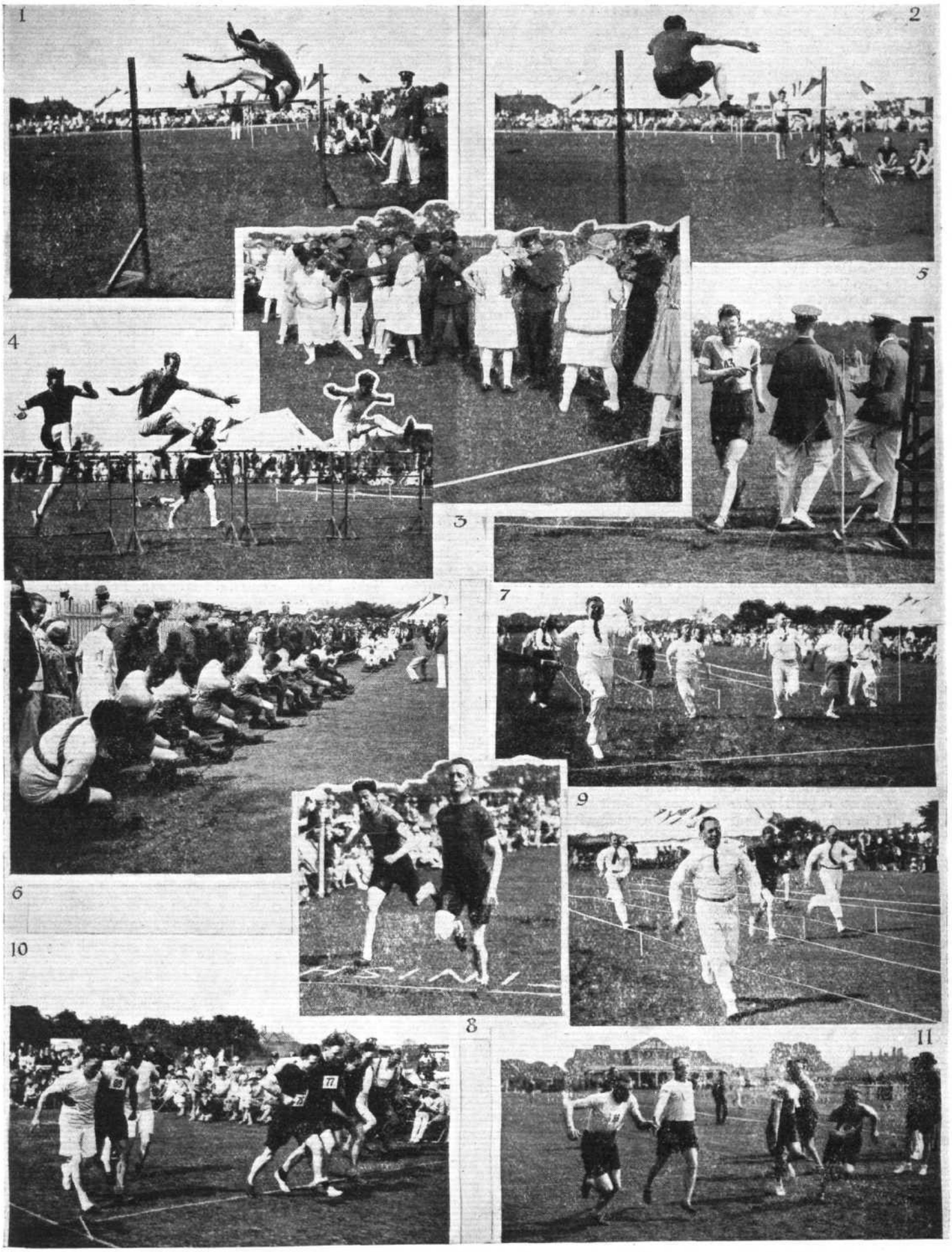
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"FLIGHT" *Photographs*

R.A.F. AT PLAY AT FELIXSTOWE LAST WEDNESDAY :—(1) Ac. Lambert winning second place in the High Jump. (2) Flight-Lieut. Darbyshire winning first place in the High Jump. (3) Threading-the-Needle Race. (4) Start of the 360 yards Hurdles Relay Team Championship. (5) No. 2 Flight wins the One Mile Relay, (220-440-880 yds.) Team Championship. (6) Final of the Tug-of-War ; No. 2 Flight (nearest camera) beats No. 1 Flight. (7) The N.C.O's. Race. (8) Finish of 220 yds. Championship ; Flight-Lieut. Martin (1st) and Ac. Griffiths (2nd). (9) Officers' Race. (10) Three-Legged Race. (11) Change over in One Mile Relay, (4/440 yds.), Team Championship.

THE WESTLAND "WIDGEON" AND ITS FUTURE

THE Westland Aircraft Co., Ltd., of Yeovil, are, we learn, prepared to offer for sale the manufacturing rights of the "Widgeon" light 'plane to any company in a position to carry on in works devoted to production with the advantage of lower overhead costs. In such a sale, construction rights, drawings, blue-prints, etc., would be included, with a sample machine having an all-metal fuselage. Our readers are quite familiar with this well-designed light 'plane. It has been used extensively by private owners, who have reported upon it always with favour. Flying clubs in South Africa have tried it on the hard conditions of training, and private owners in Australia are amongst its adherents. The only reason that the Westland Aircraft Co. wish to dispose of the rights is owing to a change in their policy. They have had to decide between the "Widgeon" and the new three-engined cabin Westland IV. As they are already so heavily engaged on the production of the Wapitis, they do not feel that they are in a position to manufacture, in addition, both the Westland IV and the "Widgeon" in sufficient numbers. The Westland IV has, in fact, aroused considerable interest, and seems to show that it is filling a decided gap amongst commercial aircraft. Already Imperial Airways have purchased one, another has been bought by the Wilson Airways, Ltd., of East Africa, and there are, we understand, a number of other orders on the tapis. So the Westland IV will be manufactured and the Widgeon sold. Altogether a sound proposition.

* * * *

The Curtiss-Handley Page Slot Installation

REGARDING the description of the Curtiss-Handley Page slot installed in a Curtiss "Seahawk," which we published on p. 481 of our issue for June 13 last, Handley Page, Ltd., inform us that, whilst based on the design information supplied by them to the U.S. Bureau of Aeronautics, this sliding type of slot is a patent of theirs, of 1920. Also, it may be noted, they have a similar type of slot installed on the machine they have made for the Guggenheim Competition, and this type was tried on a Bristol Fighter before the link type of mechanism was adopted.

Splintex Safety Glass, Ltd.

EARL HOWE, C.B.E., performed the official opening of the Splintex Safety Glass, Ltd., new factory on Monday, June 24, at South Wimbledon, S.W.19.

K.L.G. Plugs

WE are informed that K.L.G. plugs were used in the Cirrus of the AVRO "Avian" which reached China from Croydon recently, flown by Mr. Wen-Lin Chen.

Pratt's Introduce Lubricating Oils

HAVING regard to the practically limitless resources of oils of the Anglo-American Oil Co., together with their years of experience with and experimenting on the lubricating problem, it is a wonder that Pratt's oils should for so long have remained off the general oil market. Their new departure, therefore, is not really surprising, and in introducing their new motor oils they with confidence refer users to their world reputation for motor spirit. Moreover, they are taking no chances, as before putting the oils on sale, we understand, they have run off some 20,000,000 miles in testing it on British roads, including by-lanes, rough tracks, up hill and down dale, on every type of vehicle and engine, from motor-cycle and the small 7 h.p. cars to the heaviest vehicles—a world's record test. The results are to be appreciated in the "finished article." Naturally it is very important that with the present-day highly efficient engine, small or large, lubrication should be studied to obtain the best results, and as with Ethyl spirit the A.A. Co. have helped to advance that efficiency, so with their special oils they are carrying it still a step further, by catering for the requirements of the modern refined engine. One great point is that their supplies are under seal, whether in small or large quantities. Their organisation has already provided that the oils can be obtained from dealers throughout the country.

The Westminster "Wag-Tale"

IF only to help Westminster Hospital, every citizen should get ready with 6*d.* to procure a copy of "The Westminster Wag-Tale," which has just been published for helping along the good work of the hospital. 'And there's splendid value in this effort—far and away beyond many of the much-advertised books of commerce. Its pages are crammed with pictures and literature in lighter vein, and in its up-to-dateness, there is, of course, an aviation skit—by G. Pengelly Kerr. But there, obtain a copy and see for yourselves.

Auster, Ltd.

THE London establishment of Auster, Ltd., has been vacated by the company, as they have decided to centralise all their manufacture at the Birmingham works. This change operated from Monday, June 24 last. All communications should now be addressed to Crown Works, Barford Street, Birmingham.

Scintilla Magneto Success

THE French Bernard monoplane, fitted with the Hispano-Suiza engine, which crossed the Atlantic on June 13-14 piloted by M. Jean Assolant, the French pilot, also brought a success for the Scintilla magneto.

* * * *

PUBLICATIONS RECEIVED

Aeronautical Research Committee Reports and Memoranda: No. 1208 (*Ae.* 369).—A Dash-Pot for Use in Spinning Experiments on a Model Aerofoil. By T. H. Fewster. Nov., 1928. Price 4*d.* net. *No.* 1209 (*Ae.* 362).—Wool-Tufts: A Direct Method of Discriminating Between Steady and Turbulent Airflow over the Wing Surfaces of Aircraft in Flight; Applied to Explore the Region of Effect of the Slot on a Bristol Fighter Wing. By Flight-Lieut. J. A. G. Haslam, D.F.C., M.C. Nov., 1928. Price 4*d.* net. *No.* 1212 (*Ae.* 371).—Preliminary Tests on the Effect on the Lift of a Wing of the Position of the Airscrews Relative to It. By F. B. Bradfield. November, 1928. Price 9*d.* net. *No.* 1214 (*Ae.* 373).—On a Method of Delaying the Opening of an Autoslot (Wind-Tunnel Experiments). By F. B. Bradfield and R. A. Fairthorne. December, 1928. Price 6*d.* net. H.M. Stationery Office, Kingsway, London, W.C.2.

Die Weltbühne. XXV. No. 22. *May* 28, 1929. Verlag der Weltbühne, Kantstrasse 152, Charlottenburg, Germany.

Aeronautical Research Committee Reports and Memoranda: No. 1179 (*Ae.* 343).—The Airflow Around a Circular Cylinder in the Region Where the Boundary Layer Separates from the Surface. By A. Fage. August, 1928. Price 9*d.* net. *No.* 1206 (*Ae.* 367).—Wind Tunnel Experiments with Infinite Cascades of Aerofoils. By R. G. Harris and R. A. Fairthorne. Sept., 1929. Price 1*s.* net. *No.* 1210 (*Ae.* 370).—On the Effect of Air Compression on Drag and Pressure Distribution in Cylinders of Infinite Aspect Ratio. By T. E. Stanton. Nov., 1928. Price 6*d.* net. *No.* 1218. (*Ae.* 377).—The Hydrodynamic Forces on a Cylinder Moving in Two Dimensions. By H. Lamb. February, 1929. Price 4*d.* net. H.M. Stationery Office, Kingsway, London, W.C.2.

* * * *

AERONAUTICAL PATENT SPECIFICATIONS

(*Abbreviations*: Cyl. = cylinder; i.c. = internal combustion; m. = motor. The numbers in brackets are those under which the Specifications will be printed and abridged, etc.)

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7,018. W. C. WARD. Safety appliance for aeroplanes. (297,926.)
7,559. A. P. BATEMAN. Safety harness for airmen. (312,718.)
14,277. SPERRY GYROSCOPE CO. Gyro-compasses. (290,670.)
15,899. ARMSTRONG-SIDDELEY MOTORS, LTD., and J. D. SIDDELEY. I.c. engine cylinder construction. (312,809.)
18,238. BLACKBURN AEROPLANE AND MOTOR CO., LTD., and F. FESTING. Endless track motor vehicles. (312,833.)
19,933. SIEMENS-SCHUCKERTWERKE A.-G. Vapour engines for aircraft. (294,243.)
19,966. SOC. DES ÉTABS. AERA. Compensating-device for magnetic compasses. (293,798.)
23,453. A. RUDEBERG AND CO. Screw propeller. (312,867.)

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11,948. SPERRY GYROSCOPE CO. Gyro compasses. (309,924.)

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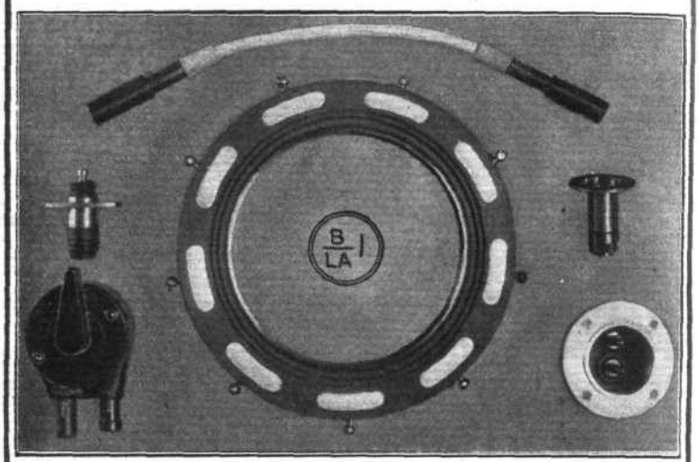
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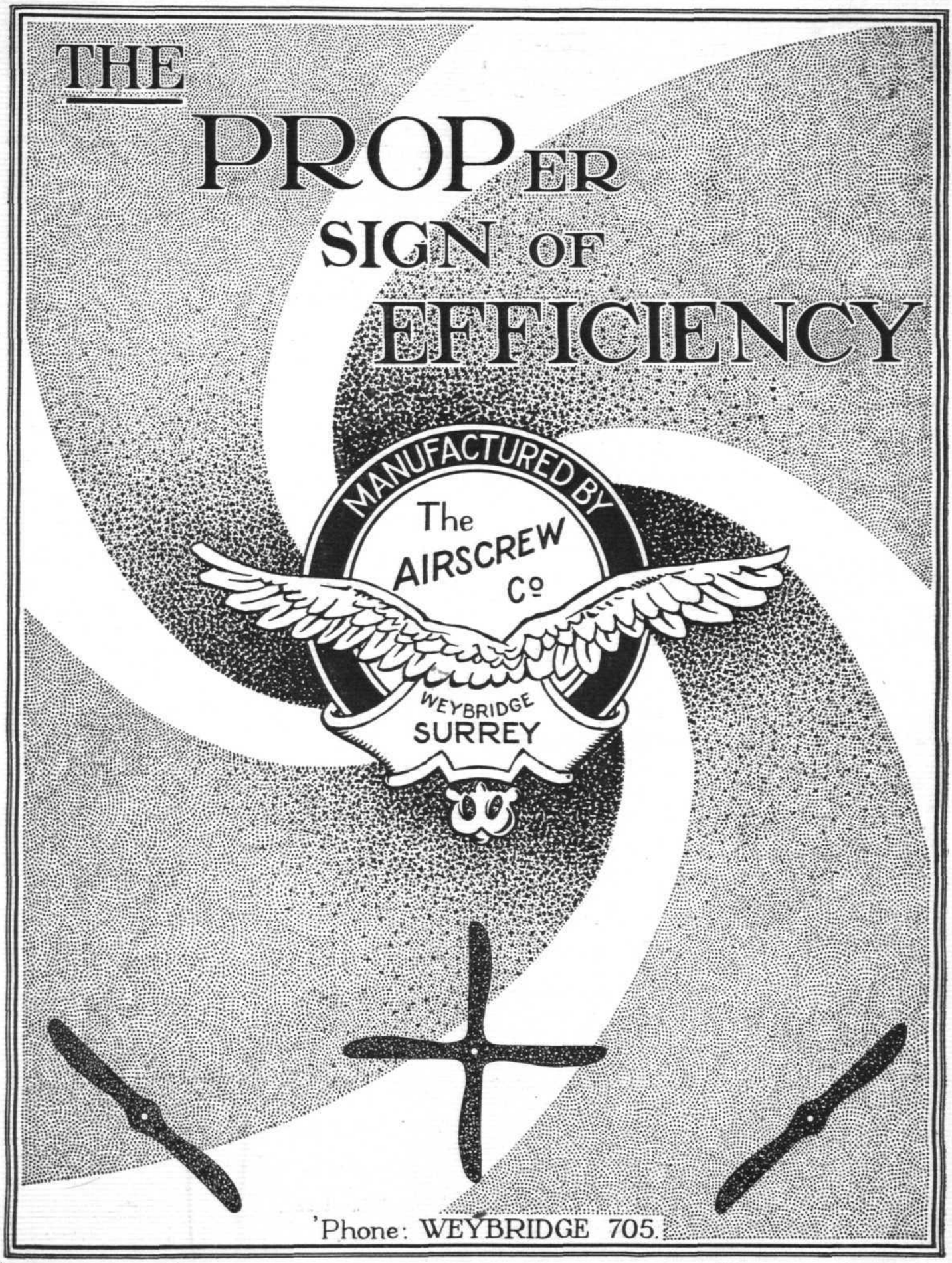
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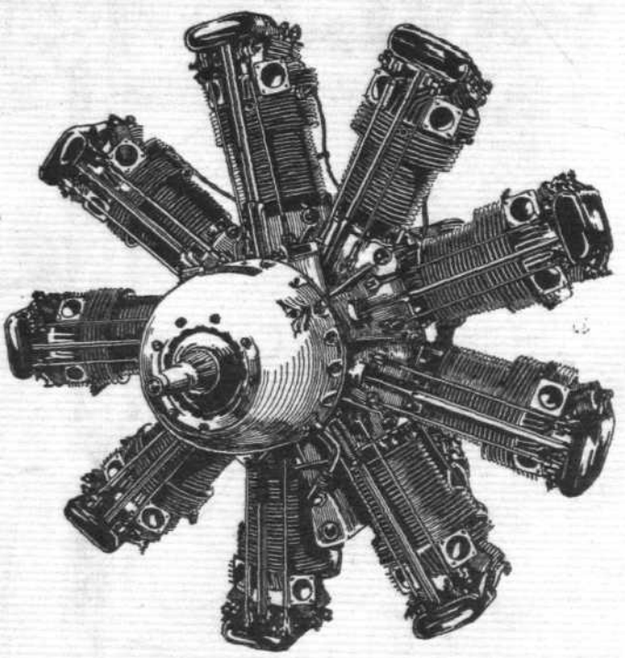
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